# Bering Strait Regional

# Energy Plan

*Serving the communities of:*

Brevig Mission
Council
Diomede
Elim
Gambell
Golovin
King Island
Koyuk
Mary's Igloo
Nome
Savoonga
Shaktoolik
Shishmaref
Saint Michael
Solomon
Stebbins
Teller
Unalakleet
Wales
White Mountain

Bering Straits DEVELOPMENT Co

ALASKA ENERGY AUTHORITY

June 2015

WHPacific

# Bering Strait Regional

# Energy Plan

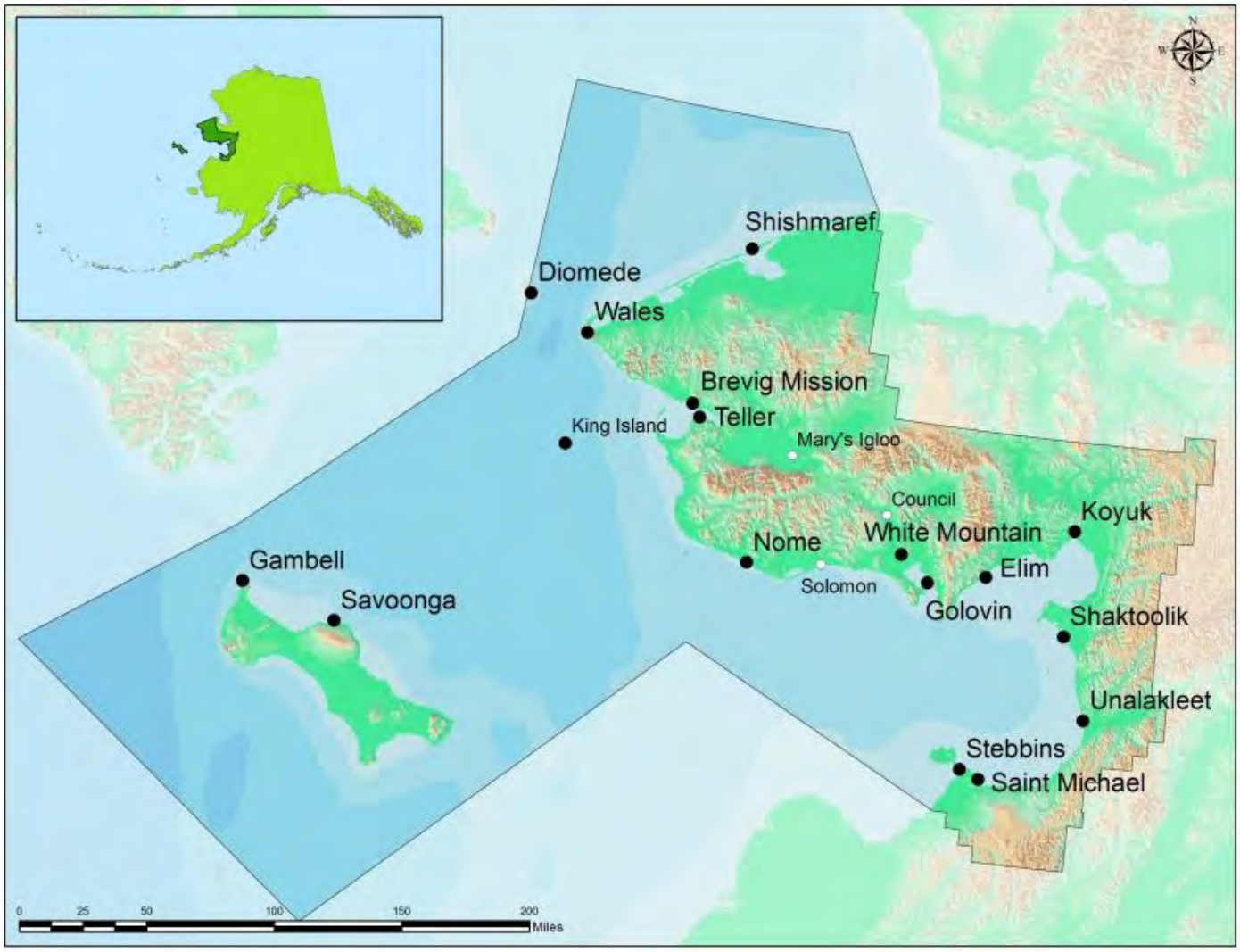
June 2015

Bering Straits DEVELOPMENT Co

ALASKA ENERGY AUTHORITY

WHPacific

*Bering Strait Region: Planning Area*



# Table of Contents

Acknowledgements ..... v
Acronyms and Abbreviations ..... ix
Executive Summary ..... 1
1 Introduction ..... 5
1.1 Methodology ..... 6
1.2 Issues ..... 7
1.3 Vision and Goals ..... 8
1.3.1 Vision ..... 8
1.3.2 Goals ..... 8
1.4 Stakeholders ..... 9
2 Regional Background ..... 11
2.1 Location ..... 11
2.1.1 Hydrology ..... 12
2.1.1 Climate ..... 12
2.2 Demographics ..... 13
2.2.1 Current Population ..... 13
2.2.2 Trends ..... 14
2.2.3 Housing ..... 15
2.2.1 Economy ..... 17
2.3 Energy Use ..... 18
2.3.1 Electricity ..... 18
2.3.2 Heat ..... 18
2.3.3 Propane ..... 19
2.3.4 Diesel Fuel ..... 20
2.3.5 Transportation Access ..... 21
2.3.6 Water and Wastewater ..... 22
3 Regional Energy Analysis ..... 25
3.1 Oil and Gas ..... 25
3.2 Coal ..... 25
3.3 Geothermal ..... 25

3.4 Hydroelectric ..... 26
3.5 Biomass ..... 26
3.6 Wind ..... 27
3.7 Solar ..... 29
3.8 Other ..... 31
3.9 Energy Efficiency ..... 32
3.9.1 Weatherization ..... 33
3.9.2 Benchmarking ..... 34
3.9.3 Water and Wastewater Improvements ..... 34
3.9.4 Village Energy Efficiency Program (VEEP) ..... 35
3.10 Regional Energy Priorities ..... 35
4 Community Sub-Regional Summaries ..... 39
4.1 Northern Sub-Region Profile ..... 40
4.1.1 Energy Issues ..... 61
4.2 South-Central Sub-Region Profile ..... 62
4.2.1 Energy Issues ..... 79
4.3 Southeast Sub-Region ..... 80
4.3.1 Energy Issues ..... 97
4.4 Saint Lawrence Island Sub-Region ..... 98
4.4.1 Energy Issues ..... 107
4.5 Nome Sub-Region ..... 108
4.5.1 Energy Issues ..... 113
5 Implementation Plan ..... 115
5.1 Prioritized Project Action list ..... 115
5.2 Assumptions ..... 115

**Figures**

Figure 2-1: Bering Strait Region Map ..... 11
Figure 2-2: State highways near Nome ..... 22
Figure 3-2: Pilgrim Hot Springs Map ..... 25
Figure 4-1: Bering Strait Region, Sub-Regions and Communities ..... 39
Figure 4-2: Northern Sub-Region ..... 40
Figure 4-3: South-Central Sub-Region ..... 62

Figure 4-4: Southeast Sub-Region Communities ..... 80
Figure 4-5: Saint Lawrence Island Sub-Region ..... 98
Figure 4-6: Nome Sub-Region ..... 108

**Exhibit**

Exhibit 1-1: Energy Plan Project Approach ..... 6
Exhibit 2-1: Bering Strait Region Historical Population 1990-2010 ..... 15
Exhibit 2-2: Comparison of Percent of Occupied Housing Completing Energy Programs ..... 16
Exhibit 2-3: Comparison of % of Houses Overcrowded ..... 17
Exhibit 2-4: Percent Space Heating Energy Used by Fuel Type in Bering Strait Region ..... 19
Exhibit 3-1: Solar PV Production at Bering Strait Native Corporation Office Building ..... 30
Exhibit 3-2: Percent of Occupied Housing Completing Energy Program ..... 33

**Table**

Table ES-1: Summary of issues, goals and potential energy projects ..... 2
Table 2-1: Average Climate Data in Bering Strait Region ..... 12
Table 2-2: 2012 Bering Strait Region Average Heating Degree Days ..... 13
Table 2-3: 2010 Population by Community ..... 14
Table 2-4: Propane Use and Costs in Bering Straits Communities ..... 20
Table 2-5: Bering Strait Region Shipping Costs ..... 22
Table 2-6: Types of Community Water and Sewer Systems and Cost to Residents ..... 23
Table 3-1: Bering Strait Region Community Wind Power Class Ratings ..... 28
Table 3-2: ANTHC Heat Recovery Study and Energy Audit Status ..... 35
Table 3-3: Regional Energy Priorities ..... 36
Table 5-1: Regional Priority Energy Actions ..... 117

**Appendices**

Appendix A. Bibliography ..... 125
Appendix B. Energy Funding Opportunites ..... 129

## Acknowledgements

*All rate-payers are stakeholders in the energy planning for the region's future. Stakeholders with current or proposed industrial-size energy loads, as well as organizations and agencies who otherwise control or manage energy resources and policies are included below along with others who assisted in the preparation of this document.*

### Bering Straits Energy Steering Committee

*Community Members*

- Johnnie Seetot, Native Village of Brevig Mission
- Warren Rock, City of Brevig, Mayor
- Reggie Barr, Brevig Native Corporation
- Toby Anugazuk, City of Golovin
- Jason Righthiemier, Nome Eskimo Community
- Joe Garney, Mary's Igloo
- Blach Garne, City of Teller
- Jay Adams, White Mountain
- Sony Mashiana, BSSD
- Warren Daniels, Native Village of Elim
- Ramona Tungiyan, City of Gambell
- Tami Slwooko, Gambell IRA
- Charles Pullock, King Island IRA
- Morris D. Nassuk, Koyuk Native Corporation
- Wayne Nassuk, Native Village of Koyuk
- Sam Mokiyuk, City of Savoonga
- James K. Nikssik, Saint Michael Native Corporation
- Vera Nikssik, Saint Michael Native Corporation
- John Lockwood, Saint Michael IRA
- Teresa W. Jack, City of Stebbins
- Jerry Okbaok, Native Village of Teller
- Michael Sookiayak, Shaktoolik Native Corporation
- Matilda Hardy, Native Village of Shaktoolik
- Johnson Eningowuk, Native Village of Shishmaref
- Richard Schulling, Solomon Traditional Council
- Melanie Bahnke, President, Kawerak
- Richard Strutz, CEO, Sitnasuak Native Corporation
- Paul Ivanoff, NSEDC
- Matt Ganley, BSNC
- Cyril Lyon NSHC
- Josie Bahnke, City of Nome
- Robert Mocan, BSHA
- Alfred Commack, BSSD
- Bill Potter, Nome Public Schools
- Doug Walrath, NACTEC

*Utility Representatives*

- Esther Lincoln, White Mountain Utilities
- Reese Huhta, Unalakleet Valley Electrical Cooperative
- Anna Sattler, AVEC
- John Handeland, Nome Joint Utilities

### Bering Straits Energy Plan Contributors

**Bering Straits Energy Plan Coordinator**

- Robert Bensin, Bering Straits Development Company

**Kawerak, Inc.**

- Bryant Hammond, Director Community and Economic Development
- Anahma Shannon, Environmental Specialist
- Debra Seetook

**Alaska Energy Authority**

- Sandra Moller, Director, Project Implementation
- Jed Drolet, Energy Information Analyst
- Jessie Huff, Energy Development Planner

**Alaska Native Tribal Health Consortium**

- Mike Black, Program Development Director
- Chris Mercer, P.E, Energy Program Engineer
- Eric Hanssen, P.E., DEHE

**Bering Straits Development Company**

- Robert Bensin, Electrical Administrator

**Bering Straits Native Corporation**

- Matt Ganley, VP Resources & External Affairs

**Denali Commission**

- Joel Neimeyer, Federal Co-Chair

**Norton Sound Health Corporation**

- Angie Gorn, Executive Director
- Cyril Lyon, Director Plant Operations

**Norton Sound Economic Development Corporation**

- Sterling Gologergen, Community Development Coordinator

**Sitnasuak Native Corporation**

- Andrew Miller, Board of Directors

**WHPacific, Inc.**

- Suzanne Taylor, Project Manager
- Nicole McCullough, Senior Planner
- Jackie Schaeffer, Energy Specialist-0p
- Jay Hermanson, Energy Director

## Acronyms and Abbreviations

| | |
|---|---|
| ACEP | Alaska Center for Energy and Power |
| AEA | Alaska Energy Authority |
| AHFC | Alaska Housing Finance Corporation |
| AIDEA | Alaska Industrial Development and Export Authority |
| AMR systems | Automated Meter Reading systems |
| ANCSA | Alaska Native Claims Settlement Act |
| ANGDA | Alaska Natural Gas Development Authority |
| ANTHC | Alaska Native Tribal Health Consortium |
| ARDOR | Alaska Regional Development Organizations |
| ARECA | Alaska Rural Electric Cooperative Association |
| ARIS | Alaska Retrofit Information System |
| ARRA | American Recovery and Reinvestment Act |
| ARUC | Alaska Rural Utility Collaborative |
| AVEC | Alaska Village Electric Cooperative |
| BIA | Bureau of Indian Affairs |
| BLM | Bureau of Land Management |
| BSDC | Bering Straits Development Company |
| BSNC | Bering Strait Native Corporation |
| CDR | Conceptual Design Report |
| CETF | Community Energy Task Force |
| CFL | Compact Fluorescent Light |
| CIAP | Coastal Impact Assistance Program |
| CIP | Capital Improvement Program |
| EfW | Energy From Waste |
| DCCED | Department of Commerce, Community and Economic Development |
| DOE | U.S. Department of Energy |
| DOL | Alaska Department of Labor (and Workforce Development) |
| DOT&PF | Alaska Department of Transportation and Public Facilities |
| EEM | Energy Efficiency Measures |
| EIS | Environmental Impact Statement |
| EPA | U.S. Environmental Protection Agency |
| ETF | Energy Technology Fund |
| EUI | Energy Use Index |
| FERC | Federal Energy Regulatory Commission |
| FHWA | Federal Highway Administration |
| HUD | U.S. Department of Housing and Urban Development |
| HVDC | High Voltage Direct Current |
| ICDBG | Indian Community Development Block Grant |
| IGA | Investment Grade Audit |

| | |
|---|---|
| IPP | Independent Power Producer |
| ISER | Institute for Social and Economic Research |
| kW | Kilowatt |
| kWh | Kilowatt hour |
| Mcf | One thousand cubic feet |
| MWh | Megawatt hours |
| NAHASDA | Native American Housing and Self Determination Act |
| NIST | National Institute for Standards and Technology |
| NOAA | National Oceanic and Atmospheric Administration |
| NRECA | National Rural Electric Cooperative Association |
| NREL | National Renewable Energy Laboratory |
| ORC | Organic Rankine Cycle |
| PFD | Permanent Fund Dividend |
| PCE | Power Cost Equalization |
| PD&R | Policy Development and Research |
| PV | Photovoltaic |
| PWS | Prince William Sound |
| PWSEDD | Prince William Sound Economic Development District |
| REAP | Renewable Energy Alaska Project |
| RUBA | Rural Utility Business Advisor |
| SNC | Sitnasuak Native Corporation |
| TED | The Energy Detective |
| UAF | University of Alaska Fairbanks |
| UCG | Underground Coal Gasification |
| USACE | United States Army Corps of Engineers |
| WtE | Waste to Energy |
| WTP | Water Treatment Plant |

# Executive Summary

This plan documents the current status of energy resources in the Bering Strait Region and presents a prioritized list of projects and strategies for reducing energy costs while maintaining or improving the current level of service. The plan, funded by the Alaska Energy Authority (AEA) and developed by Kawerak and the Bering Straits Development Company builds upon the 2009 Bering Strait Energy Report and analysis created by state and regional energy specialists. It also relied heavily on the assistance of the utility companies in the region, local energy "champions," as well as federal, state and regional participants. Together, these stakeholders verified background data, prepared goals and prioritized energy projects. It is AEA's intent to empower a team of these stakeholders and energy champions to continue the work of improving energy resources and sustainability in the Bering Strait Region well into the future.

Local community and energy profiles for each of the 16 communities in the Bering Strait region show a "snap shot" in time of the current energy demands and infrastructure. The energy platform holds the connection to current energy infrastructure, water and sewer systems, landfills, housing and the extremely high cost of energy for transportation. The goal is for this plan to become a living document that provides a tool for current and future generations on energy-related projects. It is one of ten Regional Energy Plans designed to address the regions' energy needs for transportation, electricity and heat.

The energy planning efforts were based on a local, grassroots perspective. Each community was visited and each provided their input to the community and energy profiles, as well as providing the basis of future energy projects for the Bering Strait region. This process was a way for the residents of the region to determine their energy priorities and formulate a concrete, implementable and fundable plan to achieve those priorities.

**Table ES-1: Summary of issues, goals and potential energy projects**

| ENERGY ISSUES | ENERGY GOALS | POTENTIAL PROJECTS* |
|---|---|---|
| **Energy Efficiency & Conservation** | | |
| Lack of education in energy-efficiency and conservation, no tracking of energy costs, inefficient housing design for Arctic climate and no present best practices in place.<br><br>Lack of LED street lighting and consistent auditing of housing stock. Lack of energy-efficiency upgrades on systems: water/sewer, power generation, home heating. | Provide adequate energy education in all levels and areas, calculate life-cycle costs for all energy systems, set standards and best practices for Arctic climate appropriate design and construction. Implement energy-efficiency recommendations generated by audits and current infrastructure and systems. | ▪ Energy-wise educational visits to all residential homes<br>▪ Data metering and collection for all energy systems<br>▪ Design and build for Arctic climate and set standard for all construction in the Bering Strait region<br>▪ Implement through an ESCO program all recommendations on energy audits |
| **Maintenance and Operations** | | |
| Lack of trained workforce in energy-related systems at the local level, causing high maintenance and operations expenses. | Continue to train and develop a local workforce of operators and repair technicians for all energy systems. Train local workforce to do construction upgrades for efficiency. | ▪ Institute a curriculum on energy-related jobs with local secondary and college educators to promote and design Arctic appropriate approach |
| **Energy Financing** | | |
| Outside funding for energy projects is limited and highly competitive. Lack of collaboration of funding sources. | Seek Federal and State technical assistance for planning of future energy projects, collaborate funding efforts, develop comprehensive financial strategy for maximizing energy funding. | ▪ Create a funding database for collocation of federal, state, local and private funds for energy projects |
| **Energy Infrastructure** | | |
| Inappropriately designed energy systems have led to very high M&O costs, failing systems (due to design flaws and climate change) continue to drive the costs up on all infrastructure – roads, water and sewer, housing stock, transmission lines. Energy systems rely heavily on diesel and need upgrades to accept renewable systems. | Assess current infrastructure and develop an implementation plan for upgrades, assess housing stock conditions, upgrade systems to accept renewable energy, diversify energy sources through use of alternatives. Implement alternative energy projects where appropriate – such as solar, wind, hydro. | ▪ Implementation plan for current needs<br>▪ Energy audits on all commercial/public buildings<br>▪ Assess current energy systems for upgrades to be more efficient |

| ENERGY ISSUES | ENERGY GOALS | POTENTIAL PROJECTS |
|---|---|---|
| **Planning** | | |
| Lack of effective planning efforts for implementation of recommendations for energy savings and projects. | Incorporate community level comprehensive planning in all villages throughout the Bering Strait region. | ▪ Local level comprehensive and energy planning |
| **Communication** | | |
| Logistics of the Bering Strait communities hinders effective communication between entities and project partners, general public lacks understanding of current systems, conservation measures and available programs.<br><br>Lack of communication with educational institutes and lack of sharing of information and successes regarding potential pilot projects. | Utilize communication structure in place to continue to educate and bring awareness and resources to the Bering Strait residents, educate energy users on energy consumption, energy systems and resources available.<br><br>Implement and engage with local educators, both secondary and higher, to bring energy-related topics to the current curriculum. | ▪ Implement an "EnergyWise" program to help Bering Strait regional consumers understand energy systems, distribution costs, usage and conservation<br>▪ Encourage and implement the AK EnergySmart curriculum into the local schools region wide |

* These projects are given more details throughout the plan.

# 1 Introduction

Bering Straits Development Company (BSDC) prepared this document to serve as the foundation of the Bering Strait Region's Energy Strategy. It builds upon other earlier reports and stakeholder input and is intended to present strategies to lower energy costs in the region, which includes 15 small, isolated communities and the City of Nome.

The Alaska Energy Authority (AEA) provided the funds to complete this plan. It joins other regional energy plans done or in process throughout the state of Alaska. Bering Straits hired WHPacific to assist with the plan's development. The previous *Bering Strait Strategic Energy Report*[1] provided background data that was used in this plan but was updated and formatted to meet AEA guidelines which they developed to create uniformity in the regional plans throughout the state.

The *Bering Strait Regional Energy Plan* is a dynamic, living document. It must be reviewed and updated as projects are completed, technology evolves and stakeholders contribute to regional energy understanding. By building on past actions, plans and research; moving forward with practical current solutions; and continually working to maximize new and more beneficial technology, the *Bering Strait Energy Plan* will continue to be a practical and useable document.

The Energy Plan is intended to accomplish the following:

- Provide a regional and community energy profile that clearly identifies energy data, opportunities and energy priorities.
- Provides direction for reducing operational expenses for energy in the face of increasing fuel and transportation costs and tight budgets.
- Outline a process for educating residents about energy conservation measures.
- Assist in obtaining grants that reduce energy costs.
- Develop guidance for sound alternative resource development.
- Help to identify and set energy priorities.
- Save costs and increase comfort for residents resulting from energy efficiency improvements.

The Energy Plan is not intended to:

- Remain a static document. The plan should evolve as time passes to reflect current economic realities, political constraints and opportunities, and technology.
- Serve as a design document. The plan is not intended to capture a high level of detail surrounding energy projects, and most recommended projects will require standard pre-design and design documentation.

[1] Kawerak Inc., *Bering Strait Strategic Energy Report*, 2009.

## 1.1 Methodology

This plan follows the AEA recommended regional methodology outline and presents a summary of local and regional conditions, energy use, and priority energy projects in communities within the Bering Strait Region. Projects include those focused on energy efficiency and alternative energy options. The top priority projects were ranked using the methodology developed by AEA for the renewable energy projects and tailored for the region.

The data collected for this report was gathered from existing data in published reports including the *Bering Strait Regional Energy Report*, 2009, Alaska Energy Authority *Energy Pathways* and *End Use Survey*, the AHFC Alaska Retrofit Information System (ARIS), Alaska Home Energy Rebate Program, Power Cost Equalization Reports, Institute of Social and Economic Research (ISER) information and data collected by numerous stakeholders. A bibliography of resources used in the preparation of the energy plan is included in Appendix A.

The plan is being developed in three phases; the first phase resulted in a draft energy plan; phase II involved public outreach where energy information was presented in meetings throughout the region; and phase III will include a technical and economic analysis of potential projects and a final document. Kawerak completed Phase I in 2013, along with assistance from WHPacific; while phase II was completed by BSDC and WHPacific in 2015. The overall approach is shown graphically with a general timeline inExhibit 1-1.

**Exhibit 1-1: Energy Plan Project Approach**

This plan is organized into the following chapters:

1. Introduction – an overview of the regional energy vision, regional energy issues and challenges, the goals of the plan, methodology, and stakeholders involved
2. Regional Background – presenting the physical, demographic, and energy use characteristics of the region
3. Regional Energy Analysis – a detailed look at the energy resources and opportunities of the region
4. Sub-regional Summaries – a closer look at the five sub-regions, their communities, resources and potential energy-related projects
5. Implementation Plan – project tables, partners, funding sources and timelines

## 1.2 Issues

Energy issues in the region were identified through interviews with stakeholders and energy providers in the Bering Strait Region including Nome Joint Utilities, Diomede Electrical Utilities, Golovin Power Utilities, White Mountain Utilities, Unalakleet Valley Electrical Cooperative and Alaska Village Electric Cooperative (AVEC). Below is a list of the primary energy concerns.

***Energy Management***

- Effective energy management, tailored to each community, is lacking resulting in inefficient and costly energy systems.
- Data gaps include a lack of accurate fuel data by building, energy audits and space heating data. There is also concern about the lack of standardized data and there is no consistent repository for this information.
- There is an absence of current "best practices" for efficiently operating energy systems in areas of rural Alaska like Bering Straits, and there is no strategy for who should catalog and distribute this information.
- There are no project coordinators to help manage energy audits and other projects in a community which could help to reduce costs.
- There are untrained and low paid power plant operators and high turnover among project managers.

***Inadequate Infrastructure***

- Aged infrastructure, deferred maintenance (due to lack of funding and trained work force), construction without concern for energy use, antiquated technologies, shrinking state and federal subsidies, extreme construction costs and other conditions contribute to high energy and delivery costs in the Bering Strait Region.
- There are limited commercial building and home energy audits which limit opportunities to make significant improvements to the energy systems.

***Energy Financing***

- Funding for energy projects and for properly maintaining existing energy systems is inadequate
- Funding eligibility criteria based on median income limits can create inequity between rural and urban Alaska in weatherization assistance programs.
- There is a lack of grant writers at the village level which limit energy efficiency and development opportunities.

***Education***

- There is a general lack of understanding among most homeowners in the region about how to effectively reduce energy costs.

- The concept of “energy champions” who can help to educate and keep energy projects on track on a local level, is not fully developed and many communities have not identified appropriate individuals to fill that role.
- Alternative energy opportunities are poorly understood in many communities in the Bering Strait Region.

## 1.3 Vision and Goals

### 1.3.1 Vision

The Bering Strait Regional Energy plan vision is - *Affordable and Sustainable Energy throughout the Bering Strait Region*.

### 1.3.2 Goals

To support the vision the following energy goals were developed.

**Energy Management**

- Develop and maintain a system to collect relevant energy data.
- Reduce energy consumption 15% by 2020 through energy conservation and energy efficiency measures.
- Work to establish committed energy champions in each village to participate in on-going energy planning, collect missing energy data and coordinate local energy projects.
- Retain power plant operators and project managers through improved employment conditions and training.
- Work with appropriate agencies to develop ‘best practices’ that can assist in the energy development process.

**Inadequate Infrastructure**

- Implement safe and reliable infrastructure projects that consider energy efficiency and alternative energy sources.

**Energy Financing**

- Train and develop at least two grant writers per community that have the skills to write energy and related grants.
- Seek grants to complete investment grade residential and commercial energy audits and their recommendations.

**Education**

- Educate users on how their actions impact energy consumption, how their energy heating system operates and what energy resources are available to them.
- Institutionalize energy education in the school curriculum.

## 1.4 Stakeholders

Stakeholders contacted during the development of this energy plan included local city, tribal and corporation personnel, regional energy providers, agency staff and the general public. Near the beginning of the project, stakeholders were interviewed to enable a number of industry participants to provide information and input into a wide array of energy related issues. In addition to individual interviews conducted by phone, in person and through emails, two stakeholder advisory group meetings were held in 2013 with 39 and 25 participants respectively in Phase I.

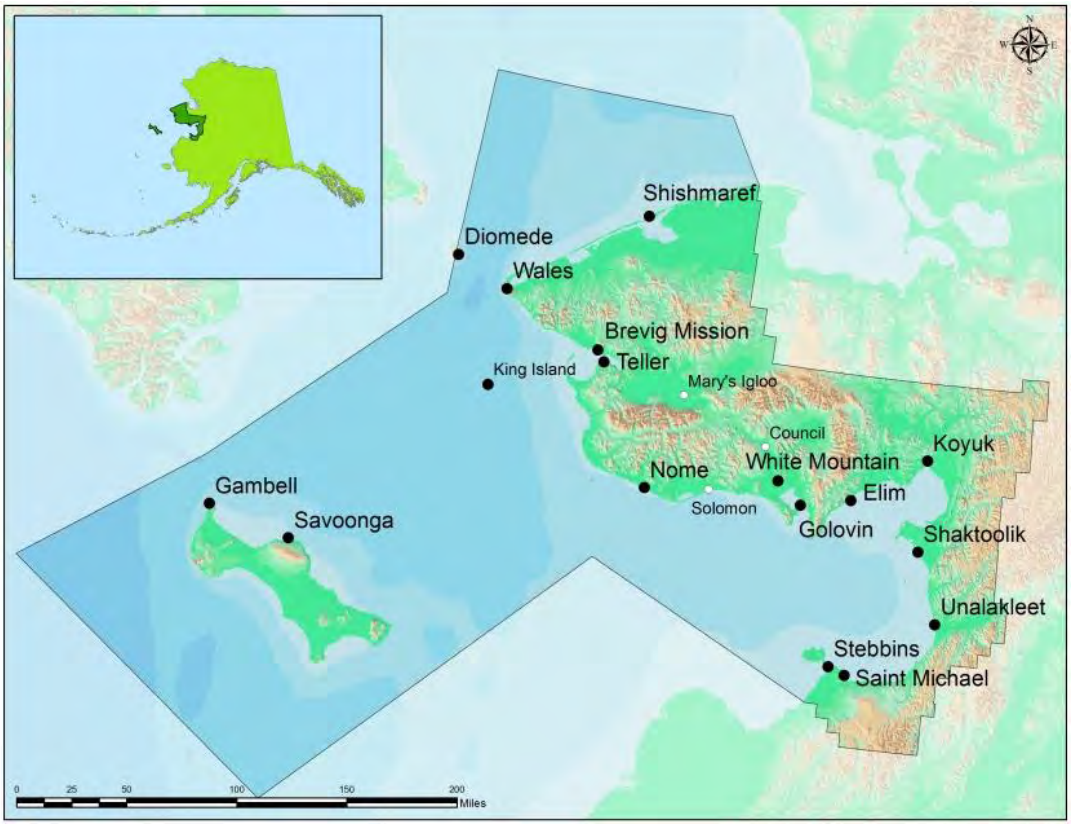
# 2 Regional Background

This section provides regional background information and describes current energy supply and demand benchmarks and projects for the region and individual communities.

## 2.1 Location

The Bering Strait Region contains 2.28 million acres[2] and lies between latitude 63 30' and 66 30' with 570 miles of coastline extending from Shishmaref in the north to Stebbins in the south. It also includes three islands; Saint Lawrence, Little Diomede and King Island. Nome is the transportation and economic hub of the region. There is no road system or unified electrical grid. The ocean is ice-free and passable for barge freight for only four to five months a year. The remainder of the year, air travel becomes the only viable way to transport goods, including fuel.

**Figure 2-1: Bering Strait Region Map**




[2] U.S. General Accounting Office. Regional Alaska Native Corporations Status 40 Years after Establishment, and Future Considerations. Report to Congressional Requesters, Washington, D.C.: GAO, 2012.

### 2.1.1 Hydrology

The Seward Peninsula lies at the southern boundary of continuous permafrost. In this environment, slight changes will cause long lasting alterations to the permafrost and consequently the quality and availability of freshwater. The arctic hydrologic system is particularly sensitive to changes in permafrost, rainand snowfall, the timing of freezeup and breakup, and the intensity of storm activity (UAF/IARC, 2003).

### 2.1.1 Climate

Communities in the Bering Strait Region primarily experience a transitional climate with the Bering Sea moderating the climate throughout the year. Normal average summer temperatures range from around 40-60 degrees F and normal average winter temperatures range from about -10 to +10 degrees F. Precipitation averages about 14 inches with an average snowfall of 48 inches. While the more northern communities experience slightly colder winters, the weather is essentially the same throughout the region. Daylight extends for almost 24 hours a day during the summer and in the winter the sun is barely seen.

**Table 2-1: Average Climate Data in Bering Strait Region**

| - | Minimum | Maximum |
|---|---|---|
| Summer temperature | 40 degrees | 60 degrees |
| Winter temperature | -10 Degrees | 10 Degrees |
| Snowfall | 33 inches | 80 inches |
| Wind | 10 knots | 15 knots |
| Average annual rainfall | 14” | |
| Average Freeze up | November | |
| Average Break up | May-June | |

Permafrost is mostly continuous through the region but is thinner than in areas further north.[3] Historically, permafrost is thawed only near deep lakes or major streams; however, there are recent reports of permafrost thawing in many communities. There are no glaciers in the region.

#### *Heating Degree Days*

The outside temperature plays a big role in how much energy it will take to keep a structure warm. Heating degree days are one way of expressing how cold a location is and can help in understanding how much fuel might be required at the village level. Heating degree days are a measure of how much (in degrees), and for how long (in days), the outside air temperature was below a certain level. They are commonly used in calculations relating to the energy consumption required to heat buildings. The higher the number the more energy will be required. The figure in Table 2-2 indicate average heating

[3] Department of Community and Economic Development website, community profiles, www.commerce.state.ak.us/dca

degree days in the Bering Strait region using available data from Nome, Golovin, Unalakleet and White Mountain. In comparison, New York averages about 5,000 heating degree days and therefore needs much less energy to heat their buildings.[2]

**Table 2-2: 2012 Bering Strait Region Average Heating Degree Days**

| JUL | AUG | SEP | OCT | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | ANNUAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 366 | 436 | 716 | 1086 | 1538 | 1886 | 1651 | 1794 | 1709 | 1414 | 983 | 480 | 14,057 |

Source: http://www.weatherdatadepot.com/

#### *Climate Change*

Climate change describes the variation in the Earth's global and regional atmosphere over time. The impacts of climate warming in Alaska are already occurring. Some of these impacts include coastal erosion, increased storm effects, sea ice retreat and permafrost melt.[4]

The Arctic has heated up twice as fast as the rest of the planet in the past three decades. By August 2013, sea ice had lost 76 percent of its volume compared to 1979, according to the University of Washington's Polar Ice Center.[5] The effects of climate change can potentially exacerbate natural phenomena. For example, thawing permafrost can cause structural failure in buildings, airports, and roads. This leads to increased maintenance costs and disruption in services.[6] It is important that planning efforts factor these potential effects into future design of energy infrastructure.

## 2.2 Demographics

### 2.2.1 Current Population

According to the 2010 U. S. Census the total population of the Bering Strait Region was about 9,500 with Nome residents making up about a third of the total people living in the region followed by Unalakleet (688), Gambell (681) and Savoonga (671) respectively. Population by community is listed in Table 2-3.

[2] Kawerak, Bering Strait Region Energy Report, 2009, page 34-35.
[4] http://www.arctic.noaa.gov/reportcard/
[5] http://www.adn.com/2013/10/05/3111739/alaska-worlds-laboratory-for-climate.html#storylink=cpy
[6] Steenbergen, Geurts, Van Bentun, Climate change and its Impact on Structural Safety, HERON, Vol. 54, No. 1. 2009.

### Table 2-3: 2010 Population by Community

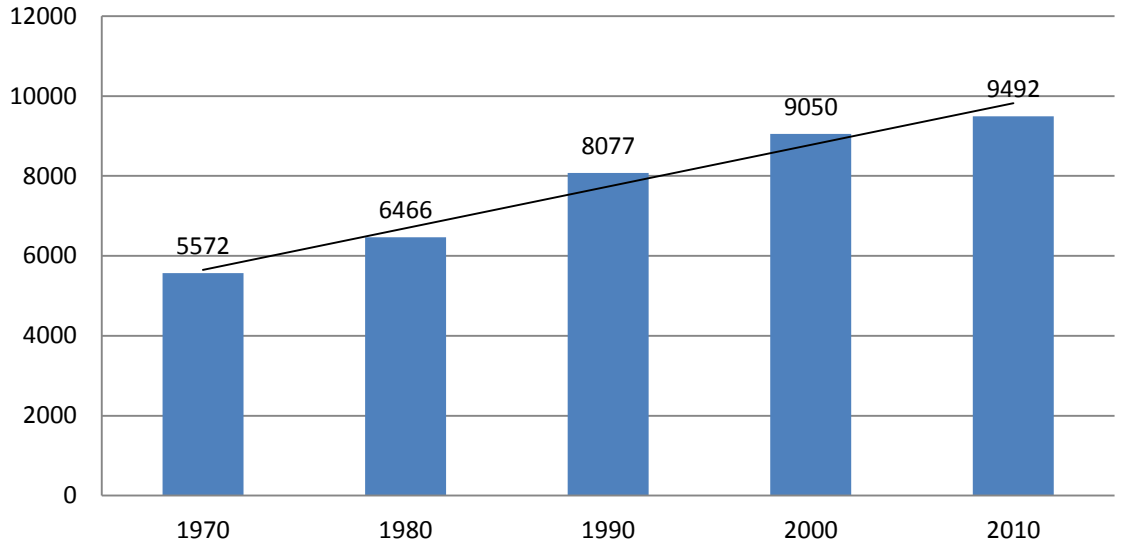
| Community | 2010 Population |
|---|---|
| Brevig Mission | 388 |
| Diomede | 115 |
| Elim | 330 |
| Gambell | 681 |
| Golovin | 156 |
| Koyuk | 332 |
| Nome | 3598 |
| Savoonga | 671 |
| Shaktoolik | 251 |
| Shishmaref | 563 |
| Saint Michael | 401 |
| Stebbins | 556 |
| Teller | 229 |
| Unalakleet | 688 |
| Wales | 145 |
| White Mountain | 190 |

*Source: 2010 U.S. Census*

### 2.2.2 Trends

Historical population for the region reveals that between 1970 and 2010 the population in the region almost doubled from 5,572 to 9,492. However, from 2000 to 2010 five villages in the region (Diomede, Teller, Unalakleet Wales and White Mountain) experienced a small decline in population, which follows a statewide trend for rural Alaska.

**Exhibit 2-1: Bering Strait Region Historical Population 1990-2010**




Between 1990 and 2010 the Bering Strait regional population increased at a rate of 0.8 percent. If the regional trend from the past 20 years continues at its current population growth rate the population of the region would be 10,279 by 2020 and 11,132 by 2030. As the population increases, so does the demand for energy. Some or all of this additional energy need could be offset by a successful energy efficiency program.

### 2.2.3 Housing

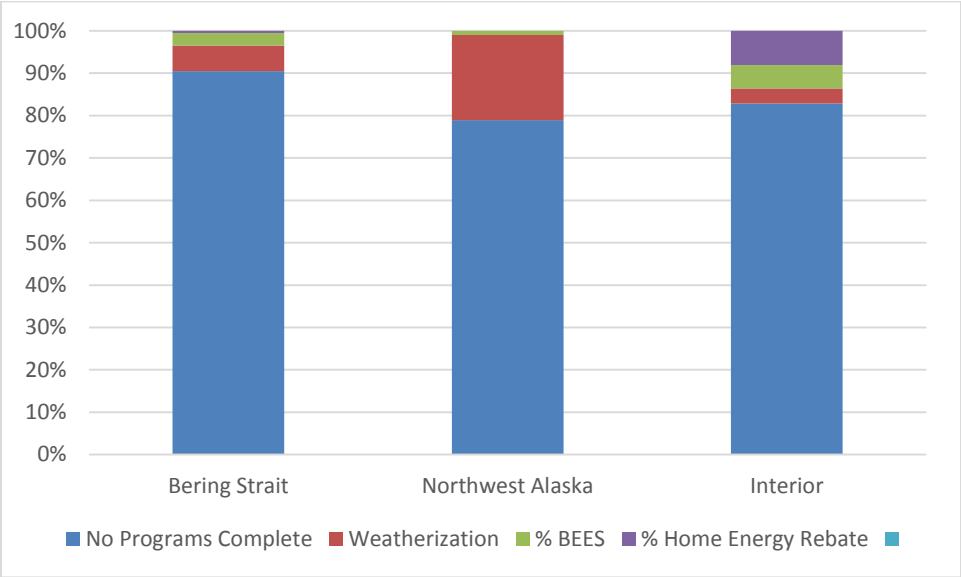
#### *Regional Housing Assessment*

The 2014 AHFC Alaska Housing Assessment used a variety of sources to provide statewide and regional housing information. Below is a summary of the housing assessment for houses in the Bering Strait region.

**Housing Units:** There are currently 3,975 housing units in the Bering Straits region. Of these, 2,756 are occupied, 241 vacant units are for sale or rent, and the remaining 978 are seasonal or otherwise vacant units. The average home size in the Bering Straits region is 1,136 square feet.

**Energy Programs:** Approximately 10% of the occupied housing units have completed either the Home Energy Rebate or Weatherization programs, or have received Alaska Building Energy Efficiency Standards (BEES) certification since 2008, compared to 21% statewide.

### Exhibit 2-2: Comparison of Percent of Occupied Housing Completing Energy Programs



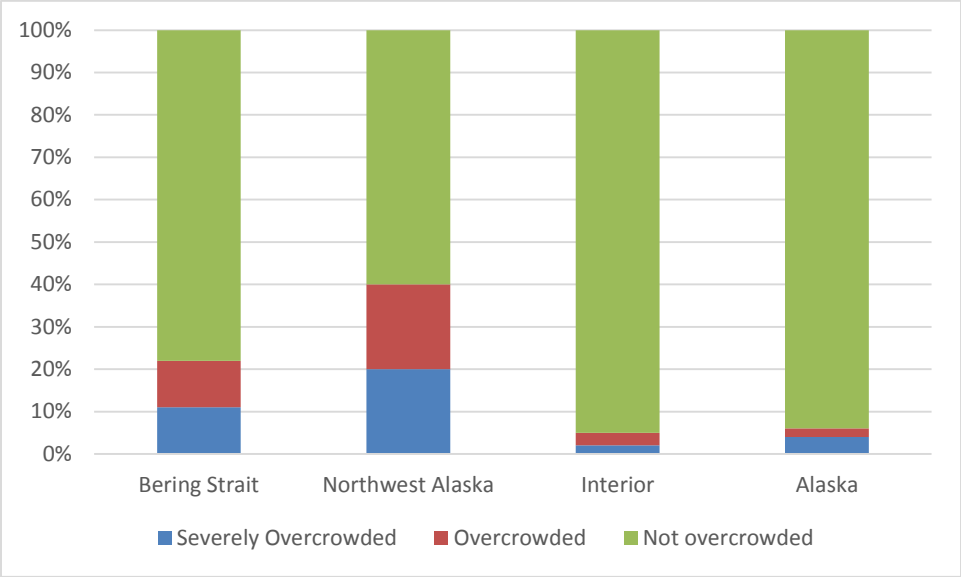

**Energy Use.** The average home uses 195,000 BTUs of energy per square foot annually. This is 42% higher than the statewide average.

**Energy Cost.** Using AKWarm estimates, average annual energy cost for homes in the region is $7,900, which is approximately 2.8 times more than the cost in Anchorage, and 3.7 times more than the national average.

**Home Air-tightness and ventilation:** An estimated 887 occupied housing units (or 32%) are relatively air-tight and lack a continuous ventilation system. These houses are at higher risk of moisture and indoor air quality-related issues.

**Overcrowding:** Twenty two percent of occupied units are estimated to be either overcrowded (11%) or severely overcrowded (11%). This is roughly 7 times the national average, and makes the Bering Straits region the third most overcrowded ANCSA region in the state.

**Exhibit 2-3: Comparison of % of Houses Overcrowded**




**Affordability:** According to American Community Survey (ACS) data, approximately 24% of households in the Bering Straits Native Corporation region spend 30% or more of total income on reported housing costs, including rent, water and sewer utilities, and energy costs. Using AKWarm estimates, the average annual energy costs constitute 15% of census median area income for occupied housing.

## *Housing Agencies*

The Bering Straits Regional Housing Authority (BSRHA), headquartered in Nome, Alaska, is a primary service provider of affordable housing projects including new construction, modernization, rehabilitation and weatherization of current homes, and the acquisition of homes throughout the Bering Straits Region. Currently they have an inventory of over 400 units in 17 villages.

### 2.2.1 Economy

The Bering Strait Region is a sparsely populated, geographically dispersed region with many small remote communities whose cash employment opportunities are limited. Year-round jobs are primarily limited to the School District, Norton Sound Health Corporation, city and tribal employment, Kawerak, transportation services and retail sales. Most communities have part-time or seasonal jobs (such as construction or firefighting) and unemployment is high. Although cash employment opportunities are limited, residents have a robust subsistence economy.

Nome is the regional hub that acts as the supply, service and transportation center of the Bering Strait Region. Funding from local, state and federal government agencies provides approximately 40% of the employee wages in Nome. Other employment opportunities occur in tourism, retail, legal, medical, construction, transportation, fishing and mining.

Low educational attainment levels and limited job opportunities have contributed to high unemployment levels in rural parts of Alaska including the Bering Strait region. One means of determining poverty levels in the region is through the Denali Commission's Distressed Community List. Eleven of the 16 communities in the region meet the criteria for distressed community status. Not meeting the criteria for distressed community are Golovin, Nome and Unalakleet. [7] The price of energy in the region impacts the economy directly and is an important factor in business decisions. High fuel prices cause transportation costs to rise which can limit economic growth.

## 2.3 Energy Use

### 2.3.1 Electricity

Residents in the Bering Strait region use diesel fuel to generate electricity. Residential uses include lighting, appliances, consumer electronics, and water heating. Cities' uses include lighting and electronics for city buildings, street lighting, municipal water, and washers and dryers at the washeteria. Schools are the largest electricity user in most villages. Schools use power for classroom electronics, ventilation equipment and lighting, electric ovens and stoves.

The cost of electricity production varies from a low of $0.50 per kWh to a high of $0.65 per kWh in the region. [8] The costs to residents are offset by the AEA's Power Cost Equalization (PCE) program which provides economic assistance to residential customers in rural areas of Alaska where the kilowatt-hour charge for electricity can be three to five times higher than the charge in more urban areas of the state.[9]

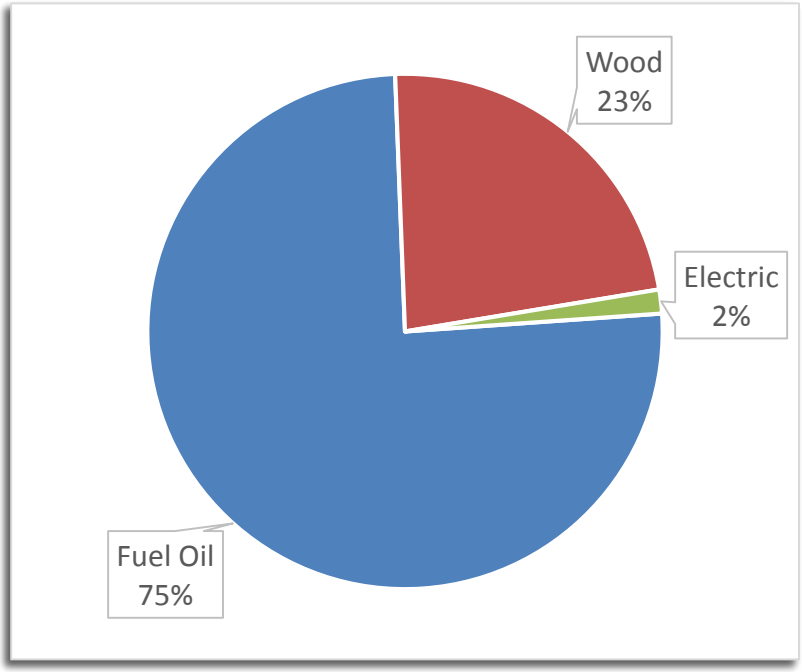
Power utility companies include Nome Joint Utilities, Diomede Electrical Utilities, Golovin Power Utilities, White Mountain Utilities, Unalakleet Valley Electrical Cooperative and AVEC.

### 2.3.2 Heat

Space heating is the most fuel intensive activity in the region. The majority of housing units in the Bering Straits region use fuel oil for space heating. This is especially the case in Nome, the region's largest community, where 95% of space heating needs are met with fuel oil. Some communities rely, in part, on nearby wood resources (driftwood and spruce) to heat their homes in the region. Wood fuel is generally used more to supplement fuel oil as evidenced by a 23% usage of wood fuel for space heating region-wide. [10] Exhibit 2-4: Percent Space Heating Energy Used by Fuel Type in Bering Strait Region illustrates the type of fuel in the region used for heating.

[7] Kawerak, Bering Strait Comprehensive Economic Development Strategy 2013-2018, July 2013.
[8] Alaska Energy Authority, Power Cost Equalization Report, 2013.
[9] Alaska Energy Authority, http://www.akenergyauthority.org/programspce.html
[10] Alaska Housing Finance Corporation, 2014 Alaska Housing Assessment, Bering Straits Region, 2014

**Exhibit 2-4: Percent Space Heating Energy Used by Fuel Type in Bering Strait Region**




Source: AHFC 2014 Alaska Housing Assessment

The price of heating fuel varies considerably from village to village. It depends on many things including the village's credit worthiness, the amount and cost of fuel already in the village's bulk storage tanks, whether or not the village was able to take advantage of a multi-village bulk purchase effort, and on the timing of the village's fuel purchase.

Villages typically purchase bulk heating fuel during the summer; a time when world petroleum prices are high. Village harbors are generally shallow and not equipped to safely accommodate larger barges; fuel is shipped to Nome and then transferred to smaller craft for delivery. In the village, fuel is transferred from bulk tanks to smaller storage tanks at residences, businesses, and community facilities. Each time fuel is moved a surcharge is added to the costs. By the time it reaches its destination, regardless of the price of fuel on world markets, heating fuel is expensive in the Bering Strait region.

### 2.3.3 Propane

Propane is more efficient than diesel, but the cost to transport propane into the Bering Strait communities remains high and is its use in the region has declined. There are many advantages to propane over diesel such as the following:

- Propane and natural gas can be used in many of the same appliances and facilities, without major modifications.
- Propane condenses to a liquid under relatively little pressure, so it can be transported more easily by truck or barge than natural gas.

- Propane reverts to a gas when released from pressure, so spills are not a problem, as they are with fuel oil.
- Propane burns cleaner than fuel oil

Disadvantages of propane are that it takes more space to transport and store than an equivalent amount of energy in fuel oil. That's because liquid propane produces less energy, per gallon, than fuel oil (132,000 Btu/gal versus 92,000 Btu/gal). Propane requires pressurized storage tanks, and more of them. Another disadvantage is that because propane is heavier than air, it can be a fire threat if accidentally released. Residential propane tanks and lines need to be well-insulated from the cold, because at very cold temperatures, propane turns from gas to liquid —meaning whatever was fueled by the propane would stop working.

Indicates the costs of propane per 100 pounds and how much household use there is in the community if known.

**Table 2-4: Propane Use and Costs in Bering Straits Communities**

| COMMUNITY | COST (100#) | HOUSEHOLD USAGE |
|---|---|---|
| Brevig Mission | $284.69 | 15 Households |
| Diomede | Unknown | Unknown |
| Elim | $290.00 | Unknown |
| Gambell | $383.00 | 50 bottles a year |
| Golovin | $350.00 | Unknown |
| Koyuk | $346.25 | Unknown |
| Nome-Bonanza | $194.25 | To local households |
| Nome-Crowley | $187.95 | Bulk to village Native Stores |
| St. Michael | $214.00 | 25 Households |
| Savoonga | $391.00 | Unknown |
| Shishmaref | $387.00 | Unknown |
| Shaktoolik | $358.80 | Unknown |
| Stebbins | $214.00 | 25 Households |
| Teller | $300.00 | Unknown |
| Unalakleet | $299.25 | Unknown |
| Wales | $350.00 | 8 bottles / year |
| White Mountain | $378.75 | all but 8 Households |

*Source: Kawerak phone survey, July, 2013*

### 2.3.4 Diesel Fuel

Because of the cost of transporting and storing diesel fuel in the remote locations of Bering Straits, retail fuel costs are very high creating correspondingly high electricity prices. Rising fuel costs impacts are magnified if one considers the additional costs associated with the limited logistical options for bulk fuel shipping, the poor economies of scale in fuel transportation, power generation and distribution, and

possible reduction and/or elimination of Alaska's Power Cost Equalization (PCE) program and the Community Revenue Sharing programs.

Many rural bulk fuel tank farms were constructed more than 20 years ago and are in poor condition. The most common problems are the piping systems to, from and within the tank farms. With substantial contributions from the Denali Commission, the bulk fuel upgrades program provided funding for the design/engineering, business planning and construction management services to build code-compliant bulk fuel tank farms in rural communities.

Bering Strait communities receive fuel for heating, generation of electricity, vehicles and other uses only during summer months when coastal areas and rivers are ice free. There are fuel-buying options which offset some of the high costs of fuel in Western Alaska.

> "The Western Alaska Fuel Group (WAFG) is another buying group that negotiates the purchase of fuel for its members. Both AVEC and WAFG select the supplier of their fuel as a result of bidding. Once selected, the successful bidder enters a two- or three- year contract for supplying fuel. Contract terms generally include a cost for the fuel that is indexed to a specific market and a transportation charge. Historically, the fuel cost has been tied to a reported rack price published by the Oil Price Information Service (OPIS) for the Northwest, typically Seattle. More recently, some bids are using spot price indexes as reported in Platt's, a global company that publishes daily market data for energy resources.
>
> The Norton Sound Economic Development Council (NSEDC) also provides fuel-purchase assistance to its members….Through this program, NSEDC acts as a purchasing agent on behalf of participants by coordinating orders, issuing the request for proposals to fuel suppliers, evaluating the proposals, and awarding the contract. NSEDC staff then serves as a single point of contact between the fuel supplier and the participants."
>
> *Source: Rural Fuel Pricing in Alaska: A supplement to the 2008 attorney general's gasoline pricing investigation, February 18, 2010.*

Another bulk fuel buying option is through the Alaska Department of Commerce, Community and Economic Development's Community and Regional Affairs division. Their loan program effective January 1, 2013 is intended to assist communities, utilities, and fuel retailers purchase bulk fuel to generate power or supply the public with fuel for use in rural communities. The new program replaces bulk fuel loan programs previously administered by the Alaska Energy Authority (AEA) and DCRA.

### 2.3.5 Transportation Access

Air travel and freight transportation provide the only efficient year round access to the Bering Strait region. During the ice-free months between June and November, barges are able to deliver freight and fuel to the communites in the region. Roads outside of the community transportation network are limited and most are seasonal. There are state highways that extend north, east, and west from Nome, connecting the Taylor mining area, Council, and Teller, respectively. Other roads include a road between

Stebbins and St. Michael, Wales and Tin City, and there are roads that serve as evacuation roads from Shaktoolik and Gambell.

**Figure 2-2: State highways near Nome**

The Alaska Department of Transportation and Public Facilities (DOT&PF) has studied a proposed road from the Dalton Highway to Nome. The first phase would connect to Tanana. The DOT&PF is not currently planning to go beyond Tanana. Given high shipping costs to Nome by barge and air, surface access to Nome would likely reduce freight and energy costs.

The residents of the Bering Strait region use fossil fuel powered snow machines, four wheelers, and boats for subsistence hunting and fishing activities and for inter-village travel. Barge delivery of fuel and deck freight and the aviation-based bypass mail systems are critical transport services in the region. In in the summer months, Teller, Solomon and Council are connected to Nome via the state highways.

**Photo 1. Ice Runway at Diomede**

With the exception of Diomede, each community in the Bering Strait region has a year-round runway. Most runways are gravel and owned by the State of Alaska. Diomede has a concrete heliport at the edge of the village. When the sea ice becomes thick enough, the village maintains an ice runway in the strait between Little and Big Diomede Islands.

The limited transportation options impact costs of goods and energy as indicated in Table 2-5. This table illustrates the costs to get 2,000 pounds sent to Nome versus the villages which is generally about twice as much.

**Table 2-5: Bering Strait Region Shipping Costs**

| | Costs to ship 2,000 pounds Via | | | |
|---|---|---|---|---|
| | Ocean Barge | | Air Cargo | |
| | *Total Cost* | *Cost/Lb* | *Total Cost* | *Cost/Lb* |
| **Anchorage to Nome** | $973 | $0.49 | $2,164 | $1.08 |
| **To Average Village** | $1,496 | $0.97 | $4,366 | $2.18 |

### 2.3.6 Water and Wastewater

Large amounts of energy are needed to operate water and wastewater systems in the Bering Straits region. Water needs to be heated with fuel oil and kept constantly circulated with electric pumps to

keep from freezing in the winter. The sewer mains and service lines are also heated during parts of the year with electrical heat trace or glycol circulation loops. As a result, energy costs associated with sewer and water utilities place a huge burden on the operator.

With the exception of teacher housing, there are no water and sewer services available in the communities of Diomede, Wales, Shishmaref, Stebbins, and Teller. Residents do laundry at the washeteria and haul water for use in their homes. In the other villages there remains several homes without water and sewer service. Buried systems use less energy than above ground systems. Table 2-6 shows the types of water and sewer systems in the communities in the region.

### Table 2-6: Types of Community Water and Sewer Systems and Cost to Residents

| Community | Water | | Sewer | | Monthly Water and Sewer Costs |
|---|---|---|---|---|---|
| **Brevig Mission** | Circulating | Buried | Gravity | Buried | $100 |
| **Diomede** | Washeteria | None | Honey Bucket | None | |
| **Elim** | Circulating | Buried | Gravity | Buried | $68 |
| **Gambell** | Circulating | Buried | Gravity | Buried | $95 |
| **Golovin** | Circulating | Buried | Gravity | Buried | $160 |
| **Koyuk** | Circulating | Buried | Gravity | Buried | $65 |
| **Nome** | Circulating | Buried | Gravity | Buried | $80 |
| **Saint Michael** | Circulating | Above Ground | Vacuum | Above Ground | $160 |
| **Savoonga** | Circulating | Above Ground | Vacuum | Above Ground | $150 |
| **Shaktoolik** | Circulating | Buried | Gravity | Buried | $60 |
| **Shishmaref** | Community Haul | None | Community Haul | None | - |
| **Solomon** | Individual Haul | None | Honey Bucket | None | - |
| **Stebbins** | Washeteria | None | Honey Bucket | None | - |
| **Teller** | Washeteria | None | Honey Bucket | None | - |
| **Unalakleet** | Circulating | Buried | Gravity | Buried | $65 |
| **Wales** | Washeteria | None | Honey Bucket | None | - |
| **White Mountain** | Circulating | Buried | Gravity | Buried | $100 |

Source: Bering Strait Regional Comprehensive Economic Development Plan

# 3 Regional Energy Analysis

The following sections describe the potential energy resources and energy efficiency opportunities across the region and regional energy priorities.

## 3.1 Oil and Gas

In the 1980s, off-shore drilling in the Norton Basin was conducted. Based on this and other research the U.S. Department of the Interior does not project undiscovered crude oil resources in the basin, although small amounts of liquid condensate are inferred to be present [11] Unconventional gas potential in Bering Straits Region such as coal bed methane, tight gas sands and gas hydrates is considered low.

## 3.2 Coal

Coal deposits are present in the region and along a number of riverbanks the eroded remnants of coal deposits can be found among the river gravels. Generally, the coal beds are thin and low grade and often in irregularly-shaped lenses rather than lateral continuous coal seams. There is some evidence to suggest thicker layers may be present at depth on the Seward Peninsula east of the Darby Mountains.

## 3.3 Geothermal

Central and eastern Seward Peninsula has areas with shallow thermal waters. Known hot springs (surface temperatures greater than 122 degrees F) include Lava Creek, Clear Creek, Serpentine and Pilgrim Hot Springs. Many of the potential geothermal resources are isolated from population and not economically feasible to develop. However Pilgrim Hot Springs, located 60 road miles north of Nome, has seen a long history of drilling, mapping and feasibility studies and exploration is ongoing at that site. The Alaska Center for Energy and Power (ACEP), in collaboration with the Geophysical Institute, is testing an innovative remote sensing technique that could reduce the cost of geothermal exploration for low and moderate temperature geothermal sites around the world. By testing and verifying this technique at the Pilgrim Hot Springs site and hopefully locating the source of the geothermal water, ACEP will be able to assess the feasibility of developing this site to benefit the region and its residents.

**Figure 3-1: Pilgrim Hot Springs Map**

Match funding for the project has been provided by AEA through the Renewable Energy Fund. Preliminary cost estimates indicate that a transmission line from the hot springs to Nome is estimated to cost $30 million and development at the site is estimated to be another $30

[11] Minerals Management Service (MMS) 2006, Undiscovered Oil and Gas Resources, Alaska Federal Offshore: U.S. Department of the Interior Minerals Management Service Alaska OSC Region.

million. Pilgrim Hot Springs is now owned by Unaatuq, LLC, a consortium consisting of BSNC; Sitnasuak Native Corporation; Kawerak, Inc.; Norton Sound Economic Development Corporation; White Mountain Native Corporation; Teller Native Corporation; and Mary's Igloo Native Corporation (MINC).

Other known geothermal springs include the Elim Hot Springs or Kwiniuk Hot Springs, located approximately eight miles directly inland from the community, and Clear Creek Hot Springs located approximately 15 miles northwest of the community.

## 3.4 Hydroelectric

Hydroelectric power does not pose significant opportunities in the Bering Strait Region. Utility grade hydroelectric requires a significant change in elevation; most of this region is relatively flat. Additionally, rivers in this region are frozen solid much of the time; for these reasons and others the region is generally not well suited for hydroelectric. A pre-reconnaissance evaluation was completed in 1982 for a hydroelectric project in the Elim Area. It concluded that the potential is limited due to either flat stream gradients or marginal water supply.

## 3.5 Biomass

Alaska's primary biomass fuels are wood, sawmill wastes, fish byproducts, and municipal waste. In the Bering Strait region, wood, driftwood and fish oil are the most prevalent biomass resources. Biomass is a viable energy source in several communities in the Bering Strait including Elim, Golovin, Nome, Shaktoolik, Saint Michael, Stebbins, Teller, Unalakleet, and White Mountain. Wood stoves are already installed in many of the homes and when fuel oil is expensive, residents have historically found it cost effective to gather and burn wood to heat their homes.

Although no official inventory has been done, there are regional wood resources in the driftwood from the Yukon River. Fishermen confirm that some years, this driftwood can clog portions of Norton Sound and create a hazard to navigation in the spring. Large amounts wash up along the Seward Peninsula with each big storm. However, in some communities, such as Shaktoolik, the driftwood provides a breakwater that reduces erosion to the community and according to their hazard mitigation plan should be left in place.

Carefully planned harvesting of wood is needed to have a sustainable woody biomass project. Funding ($50,000) is available through the Department of Natural Resources to prepare forest stewardship plans. To date this funding has not been applied for and no forest stewardship plan has been completed for the region.

One of the primary monetary benefits of using biomass as a fuel source is that the money spent on heating fuel will remain in the local economy. This will promote economic sustainability in communities that have struggled to maintain healthy local economies. In addition, using biomass for heat will stabilize heat energy costs with future costs rising much less than projected oil costs. Other benefits of using wood as an energy resource include that it can provide wildfire mitigation, cause a reduction in fuel spills and navigation hazards and enhance wildlife habitat if managed correctly.

Challenges of biomass include:

- Lack of access to the wood resource;
- Harvested wood takes time to cure;
- Requires planning and management of resources;
- Permission is needed to cut wood;
- Driftwood may be saltwater saturated presenting additional challenges; and
- Space must be allocated for boiler, wood processing, and resource storage.

In Elim, ANTHC recently installed a Garn cordwood boiler to offset heating costs at the water treatment plant. The project will enable Elim to utilize locally available wood resources to offset an average of 4,000 gallons of fuel per year and reduce the water utility's operating costs by over $12,000 annually[12]. One of the advantages of this system is that money spent on wood stays in the community. ANTHC reports that, if used correctly, this boiler could provide all the energy needed to heat and circulate water. However, it is important to realize that it is not like a residential wood stove. Logs must be split for short, clean, hot burns rather than the slower sustained burn achieved with whole logs in a wood stove. These short burns only need to occur about three times a day. Additional operator training may be needed to optimize the process. ANTHC staff reports that the system is liked by most and other water treatment plants and other infrastructure should be considered for similar projects.

Wood pellet manufacture in increasing in Alaska, with both small and large scale operations in place in the state. The largest facility, Superior Pellets of North Pole has an estimated production capacity of 30,000 tons per year. A group of individuals have expressed interest in developing wood pellet accessibility and distribution in Nome. As there are currently no local sources of pellets in the Bering Strait Region, the group is evaluating shipping costs and bulk orders from elsewhere in Alaska and the lower 48. It is unknown whether the group will pursue a cooperative or for-profit business model in the future.

## 3.6 Wind

The Bering Strait Region has abundant wind resources available for energy development. Costs associated with fossil fuel-based generation and improvements in wind power technology make this clean, renewable energy source attractive to primarily the coastal communities where strong winds prevail. Several communities in the region already have wind systems constructed and others are being assessed for feasibility as shown in Table 3-1.

The quality of a wind resource is key to determining the feasibility of a wind project. But other important factors to consider include the size of a community's electrical load, the price of displaced

[12] Hanssen, Eric, LCDR, P.E., LEED AP. "Energy Efficiency in the Arctic: ANTHC Engineers Reduce Energy Costs for Rural Alaskan Communities." Machinatores Vitae: United States Public Health Service Engineer and Architect Newsletter, July 2012: 4-9.

fuel such as diesel, turbine foundation costs, the length of transmission lines, and other site-specific variables. Potential wind power is rated on a scale of one to seven with seven being strongest. [13]

Each of the communities in the Bering Strait region that has been rated for wind potential has a Wind Power Class of 3-7 indicating a high potential for wind power in the region. Table 3-1 lists the communities and their power class ratings along with the best potential wind areas identified.

### Table 3-1: Bering Strait Region Community Wind Power Class Ratings

| Community | Estimated Wind Power Class (Location) | Project and Status (if any) |
|---|---|---|
| Brevig Mission | 7 (Port Clarence) | Wind Study identified |
| Diomede | 7 (Area wide) | Wind Study identified |
| Elim | 6 (Hill 744), 4 (more easily accessed western ridge) | Feasibility study (2013) |
| Gambell | 7 (Airport) | AEA and AVEC constructed 3-turbine 300KW system. (2010) |
| Golovin | 6 (Point 712), 4 (ridge east of town), 3+ (Airport) | Met Tower pending |
| Koyuk | 5 (Hill 418 four miles SW), 4 (Hill 408 four miles NE of town) | Feasibility study on hold |
| Nome | 7 (Newton Peak), 6 (Banner, Anvil and Newton Peaks) | Constructed 18-turbine, 2.97 MW system, plus intertie. (2010, 2012) 2 additional turbines two EWT 900 Kilowatt units installed in 2013 |
| Saint Michael | 6 (Saint Michael Mountain), 4 (1.5 miles NW) | Wind resource conceptual design currently underway for site 1.5 miles NE of Stebbins on rd. to St. Michael.(2013) |
| Savoonga | 6, 5 (Airport) | AEA and AVEC constructed 2-turbine 200KW system. (2008) |
| Shaktoolik | 4 (one mile NW), 3 (in town) | AEA and AVEC constructed 2-turbine 200KW system. (2012). Native Store has 3 Skystreams. |
| Shishmaref | 5 (1.5 miles SW), 4 (Airport) | Wind resource study proposed |
| Stebbins | 6 (one mile N at Cape Stephens, one mile S at Hill 225) | Wind resource conceptual design currently underway for site 1.5 miles NE of Stebbins on rd. to St. Michael (2013) |
| Teller | 6 (Hill 519 3.5 miles SW, also along the road to Nome at 700 feet elevation about 7 miles S of town. | Wind resource study currently underway (2013) |
| Unalakleet | 4 (Airport) | AEA and Unalakleet Valley Electric Cooperative constructed a 6-turbine system, with boiler and heat recovery loop. (2009) |
| Wales | 7 (much of region) | AEA and Kotzebue Electric constructed 2-turbine system with battery storage. (1998, currently being dismantled) |
| White Mtn. | 3 (Hill 396, E of town) | MET Tower Pending |

[13] Alaska Energy Authority. *2011 Power Cost Equalization Data.* Anchorage: State of Alaska, 2012.

One identified potential project was a combined wind power project for Stebbins and Saint Michael, with the turbines to be located at Saint Michael Mountain. It is anticipated that wind power generation will reduce fuel needs for power generation. The USFWS has determined that turbines generally should be located 1/2 mile from the ocean and ¼ to ½ mile (1/2 mile preferred) from a raptor nest to avoid bird impacts. A consultation early in the process with USFWS could be beneficial. A Federal Aviation Administration (FAA) permit is also required to avoid potential airspace conflicts.

## 3.7 Solar

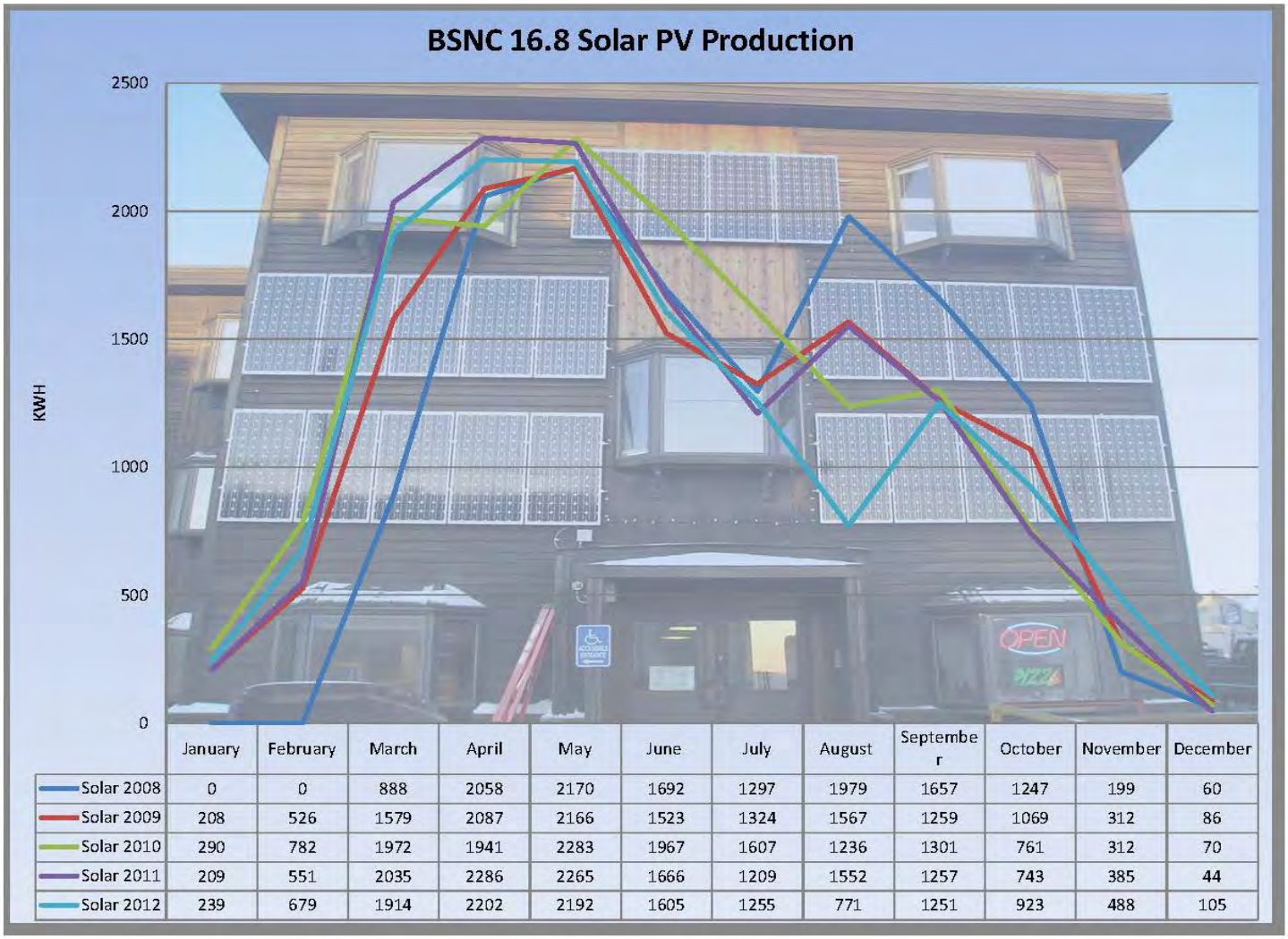
Solar technologies such as photovoltaic and solar thermal heating systems are well-established and proven in many applications world-wide and have recently become a reliable source of power in many arctic and sub-arctic communities in Alaska. Solar energy can tap both direct and reflected sunlight. This makes April the most productive time of year for solar collection, even though days are longer in the summer. Insolation is a measure of the amount of solar radiation received on a given surface area. Most of the communities in the Bering Strait region have an Annual Average Solar Insolation of less than 3.5 $kWh/m^2/day$. (BSDC)

"Solar thermal" heating systems use pumps or fans to move energy to a point of use and are generally used for small projects such as domestic hot water. A larger role for solar thermal hot water systems is emerging as advances in heating systems allow solar-heated fluid to supply in-floor systems currently heated by conventional fuel boilers.

A solar PV heating project is underway in Nome.[14] In 2008, solar collectors were installed on the BSNC office building to provide 16.8 kW of power displacing 1,000 gallons of diesel fuel per year. BSNC has also installed solar water heaters for two of their apartment buildings. Nome is experimenting with the use of evacuated tube solar collectors which, in Nome's climate, are more efficient and more cost effective than panels. The following exhibit shows five years of Solar PV production at the BSNC office building. It shows a spike in Solar PV production in the late winter and early spring months when the sun returns and the air temperature is cool.

[14] (Alaska Energy Authority 2011)

## Exhibit 3-1: Solar PV Production at Bering Strait Native Corporation Office Building




| | January | February | March | April | May | June | July | August | Septembe r | October | November | December |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar 2008 | 0 | 0 | 888 | 2058 | 2170 | 1692 | 1297 | 1979 | 1657 | 1247 | 199 | 60 |
| Solar 2009 | 208 | 526 | 1579 | 2087 | 2166 | 1523 | 1324 | 1567 | 1259 | 1069 | 312 | 86 |
| Solar 2010 | 290 | 782 | 1972 | 1941 | 2283 | 1967 | 1607 | 1236 | 1301 | 761 | 312 | 70 |
| Solar 2011 | 209 | 551 | 2035 | 2286 | 2265 | 1666 | 1209 | 1552 | 1257 | 743 | 385 | 44 |
| Solar 2012 | 239 | 679 | 1914 | 2202 | 2192 | 1605 | 1255 | 771 | 1251 | 923 | 488 | 105 |

*Source: Robert Bensin, Bering Strait Development Company*

In 2013 a pilot solar project was completed in Ambler in the Northwest Arctic Borough. The project included the installation of a solar array to power the water plant and sewer system. On sunny days the utilities are wholly powered by solar generated electricity. In March, production was about 800 kWh per month providing an estimated savings of $6,500 to $7,500 a month off the operation of the plant, offsetting approximately 750 gallons of fuel. For a lifetime of about 25 years, it will give a savings of a minimum $230,000 and an offset of 27,000 gallons of fuel. At a cost of $75,000 the payback for the solar array system is 11.4 years[15].

*Ambler pilot solar project*

The UAF Chukchi Campus in Kotzebue operates a solar array for power generation. It has produced 1.02 megawatt hours of energy in the first four months of 2013. In April alone, the solar production was 597 kWh. These pilot projects may open the door to further solar projects in the Bering Strait Region.

## 3.8 Other

Another potential power source in Alaska is Ocean and River Hydrokinetic. Alaska's long coastline and extensive river networks provide potential to meet some of the state's energy needs. Ocean and river energy projects convert the kinetic energy of the moving water into electricity via hydrokinetic devices. Hydrokinetic power is supplied by tidal waters, waves, and river flow.[16]

There is a potential hydrokinetic resource in the channel between Brevig and Teller. In 2011, AVEC did bathymetric surveys as part of other research in the area and discovered bottom scouring from ice. AVEC chose not to go further with the project because of the difficulty of finding a weather window suitably long enough to complete their work. Brevig Mission or Teller could apply for a permit and go forward with the project; however, residents fear that the hydrokinetic devices may interfere with subsistence activities.

[15] Ambler Water Treatment Plant statistics may be accessed at https://easyview.auroravision.net/easyview/index.html?entityId=1311617

[16] Triplett, Barbara. "Ocean and River Energy." Update: Alternative Energy & Energy Efficiency, Summer 2011: 1.

## 3.9 Energy Efficiency

Energy efficiency plays a critical role in decreasing energy costs. Particularly In the arctic regions, energy efficiency is important in order to get the most benefit while expending the fewest resources. Improving the energy efficiency of structures saves money, conserves fuel and materials, and reduces pollution.

**Energy Efficiency for Regional Planning**

…The benefits of efficiency are many; reduced capital costs by not overbuilding energy generation systems, reduced annual operating and resource costs by not generating more energy than a community actually needs, decreased impact of emissions associated with the non-renewable resources, and increased comfort and control in buildings.

*AEA Regional Planning Methodology Guidelines*

There are several weatherization and energy efficiency programs available to rural Alaska residents including the following:

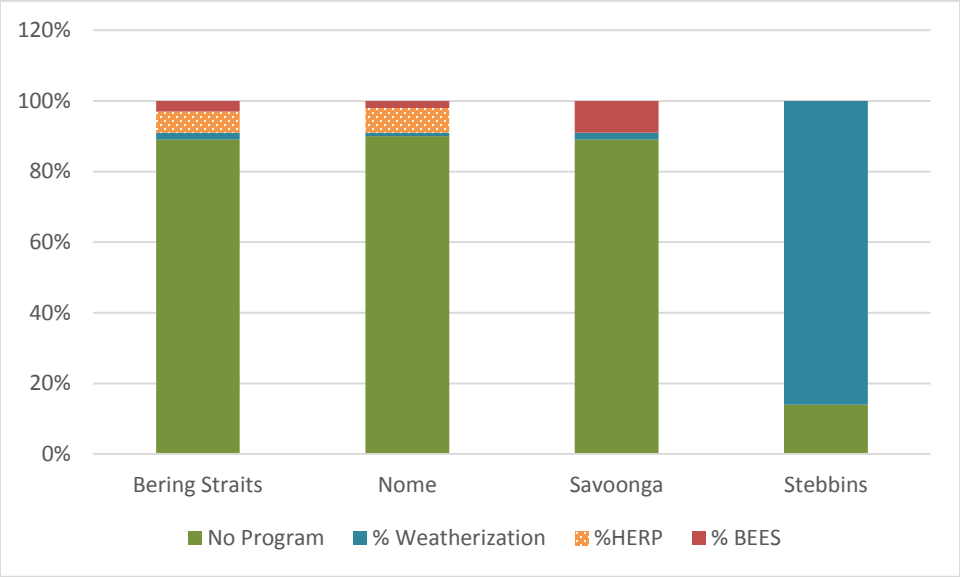
- Housing Authority Weatherization (AHFC Service Providers – i.e. Bering Straits Regional Housing Authority) – combined state and federal dollars used to provide weatherization to residential homes in Alaska. This is an income based program.
- RurAL CAP Weatherization – homes weatherized by AHFC service providers do not qualify. These are both private and federal funds. Like the Housing Authority Weatherization program, this is an income based program.
- RurAL CAP Energy Wise –no income restrictions. This program provides education on behavior change and energy-efficiency.
- AHFC Home Energy Rebate Program – State of Alaska funded program that reimburses homeowners when energy-efficiency ratings are improved and energy conservation projects are completed. The program has no income restrictions. Participants cannot participate in both the Weatherization and Home Energy Rebate Programs.
- AHFC New Home Efficiency Rebate Program – for new construction. No income restrictions. This is a loan reduction program.
- AKEnergySmart Curriculum http://www.akenergysmart.org/ is an educational tool available through a collaboration from AHFC, Renewable Energy Alaska Project (REAP) and Alaska Center for Energy and Power (ACEP).

There have been several energy audits and energy efficiency improvement programs that were implemented in the past 10 years including investment grade energy audits by AHFC, and energy audits in public buildings through the State of Alaska or the U.S. Department of Energy's Energy Efficiency Community Development Block Grant program . This resulted in energy audits throughout the Bering Straits Region.

According to AHFC, approximately 10% of housing units in the Bering Straits region have participated in the Weatherization or Home Energy Rebate program, or have received BEES certification since 2008. The Bering Straits region has the second lowest participation of all the regions with approximately 6% of housing units in the region completing the Home Energy Rebate or Weatherization programs, with an

additional 3% certified to meet BEES. Participation varies widely by community, from an estimated zero housing units in Gambell participating to a high of 86% of housing units in Stebbins completing one of the programs. The highest participation in the BEES program occurred in Savoonga where 8% of homes have been certified to meet BEES. Regionally, only 1% of housing units have participated in the Home Energy Rebate Program. The Weatherization program has varying levels of participation by community, from an estimated 0% participation in Savoonga to a high of 86% in Stebbins completing a weatherization retrofit. Exhibit 3-2 illustrates the percentage of occupied housing that completed an energy efficiency energy program such as weatherization, Home Energy Rebate Program and the Building Energy Efficiency program and the percentage of homes that did not benefit from those programs.

**Exhibit 3-2: Percent of Occupied Housing Completing Energy Program**




Source: AHFC 2014 Housing Assessment

### 3.9.1 Weatherization

AHFC administers weatherization programs that have been created to award grants to non-profit organizations for the purpose of improving the energy efficiency of low-income homes statewide. These programs also provide training and technical assistance in the area of housing energy efficiency. Funds for these programs come from the U.S. Department of Energy as well as AHFC; however, state money makes up the bulk of the funding (Weatherization Programs 2013).

The focus of weatherization is to increase the energy efficiency, safety, comfort and life expectancy of the homes. Typical improvements include the caulking and sealing of windows and doors, adding insulation to walls, floors and ceilings, and improving the efficiency of heating systems. By making

homes more energy-efficient, families spend less for heating, freeing up more household income for other basic necessities and expenditures which help support local economies[17].

### 3.9.2 Benchmarking

Using American Recovery & Reinvestment Act (ARRA) funds through the State Energy Program, the AHFC conducted an extensive benchmarking program that included 1,200 public facilities statewide including several in the Bering Strait region. By benchmarking a facility, owners and managers can identify trends in a building's energy use and compare use and operating costs to other buildings. Also by benchmarking, facility owners become more aware of how their decisions on design, construction and operations dramatically affect energy usage and costs throughout the life of the building. In 2011 and 2012 AHFC also funded 327 audits statewide using ARRA funds through the State Energy Program.

In the Bering Strait Region, AHFC conducted audits primarily on schools and a few other public buildings as shown in Table 3-2.

**Table 3-2: AHFC Energy Audits in the Bering Strait Region**

| | |
|---|---|
| School Audits | Brevig Mission, Gambell , Elim, Teller, Koyuk, Shaktoolik, Savoonga, Shishmaref, Stebbins, Unalakleet and Unalakleet School office building, and Wales |
| Nome Public Building Audits | City Hall, Recreation Center, Public Works building, Volunteer Fire Station, Icy View Fire Station |

### 3.9.3 Water and Wastewater Improvements

The Alaska Native Tribal Health Consortium (ANTHC), Division of Health and Engineering also has an active program to increase energy efficiency focusing on decreasing energy costs in the water and wastewater systems, which have a great potential for energy efficiency improvements. Communities with above ground systems experience the greatest heat loss and are the most inefficient. In 2009, ANTHC formed the Energy Projects Group to help address energy sanitation issues in rural Alaska.

According to Alaska Native Tribal Health Consortium (ANTHC) sanitation systems account for between 10-35% of a community's total energy use (Gavin Dixon, 2013). According to recent studies done nearby in the Northwest Arctic, electric energy makes up approximately 30 to 33 percent of the annual utilities energy requirement, while heating requirements account for the remaining 67 to 70 percent of the load (Mitchell, 2013). Improvements can be made to insure reliability and to reduce energy use. Significant energy savings can occur through the capture of waste heat, incorporating the use of alternative energy and carefully calibrating the operating system, such as operating pressures and temperatures and pumping flow rates.

[17] Weatherization Services. n.d. http://www.ruralcap.com/index.php?option=com_content&view=article&id=170&Itemid=85 (accessed January 10, 2013).

In the Bering Strait Region, ANTHC has conducted energy audits for public buildings particularly in the water treatment plants and health clinics. They have also completed heat recovery studies to identify opportunities to capture waste heat, and thus reduce energy costs, and have successfully applied for funding and completed several energy projects in the region including heat recovery projects. A list of the Heat Recovery and Energy Audits are shown in Table 3-2. Each community facility audited has a detailed energy improvement plan with the most cost effective interventions recommended. In general the audits revealed poor insulation, inadequate sealing of doors and windows and lack of energy efficient lighting.

**Table 3-2: ANTHC Heat Recovery Study and Energy Audit Status**

| Community | Heat Recovery Study | Energy Audit |
|---|---|---|
| Brevig Mission | X | |
| Savoonga | X | Water Treatment Plant |
| Shaktoolik | | Tribal Office |
| | | Health Clinic |
| | | Water Treatment Plant |
| Shishmaref | X | |
| Stebbins | X | |
| Teller | | Water Treatment Plant |
| | | Health Clinic |
| White Mtn. | X | |

In Saint Michael, ARUC is completing installation of energy saving boilers, electrical upgrades, and vacuum sewer pumps. They have recently applied for AEA money for a recovered heat system in Savoonga which, when installed, is estimated to save 8,800 gallons of fuel per year. In Golovin, a brand new water treatment plant is under construction along with a new piped water system for half the town. After construction of the new water plant, energy saving projects there will be assessed.

### 3.9.4 Village Energy Efficiency Program (VEEP)

The AEA received authorization from the State of Alaska to Establish the Village Energy Efficiency Program (VEEP) under AS 44.83.080. Title 3 of the Alaska Administrative Code, 3AAC 108.400 - 3AAC 108.499 shows the regulations for this program. In the 2014 funding cycle, the state Legislature made $900,000 available for small, high-energy cost communities to implement energy efficiency and conservation measures in their public buildings and facilities. Eligible applicants include municipalities, cities, school districts, unincorporated villages, Alaska Native regional and village corporations, 501(c)3 tribal consortiums, regional housing authorities and traditional councils.

## 3.10 Regional Energy Priorities

The following table contains regional energy priorities. Local energy projects are identified in the contained in the next chapter. The regional projects were identified through capital projects lists and

discussions with utility operators, AEA and stakeholders. They are broken down into the following time tables:

- Immediate projects which are currently underway or expected to begin in the next 12 months,
- Short range, expected to start within 1-5 years,
- Medium range projects expected to take place between 5-10 years, and
- Long range projects which are expected to occur beyond 10 years and can be more speculative in nature.

### Table 3-3: Regional Energy Priorities

| Time frame | Project | Estimated Costs |
|---|---|---|
| **Data Collection** | | |
| Immediate 0-1 year | ▪ Seek funding for Energy Audits –residential, public and commercial buildings | $5,000 per grant |
| Short 1-5 years | ▪ Collect community wide energy end use data for electricity and space heating | $15k per Community |
| Medium 5-10 years | ▪ Complete Energy Audits –residential, public and commercial buildings | Varies |
| **Training and Education** | | |
| Short 1-5 years | ▪ Implement K-12 Alaska Smart Energy curriculum. | Unknown |
| | ▪ Conduct grant training specific to energy projects. | Approx. $5,000 class |
| | ▪ Provide training to prepare workforce for near term jobs in the energy sector and to improve operator knowledge to operate energy systems more efficiently | Approx. $2,500-$10,000/class |
| | ▪ Conduct Village Energy Planning workshops | $5k per Community |
| **Collaboration** | | |
| Immediate 0-1 year | ▪ Collaborate with regulatory agencies to overcome energy project development hurdles | N/A |
| | ▪ Participate in discussions regarding long term projects that could benefit energy users such as Western Access Road, Natural Gas pipeline, Nome Regional Port, etc. | N/A |
| | ▪ Maintain an on-going dialogue with higher education institutions and agencies regarding potential pilot energy projects | N/A |
| **Energy Efficiency** | | |
| Immediate 0-1 year | ▪ Replace street lights with LED street lights | $5k per Community for inventory |
| | ▪ Seek funding for an appliance replacement program | $5,000 per grant |
| | ▪ Encourage use of 'green', climate appropriate, building technology in all new construction including schools and housing. | N/A |
| Medium 5-10 years | ▪ Complete Energy Audits –residential, public and commercial buildings | Varies |

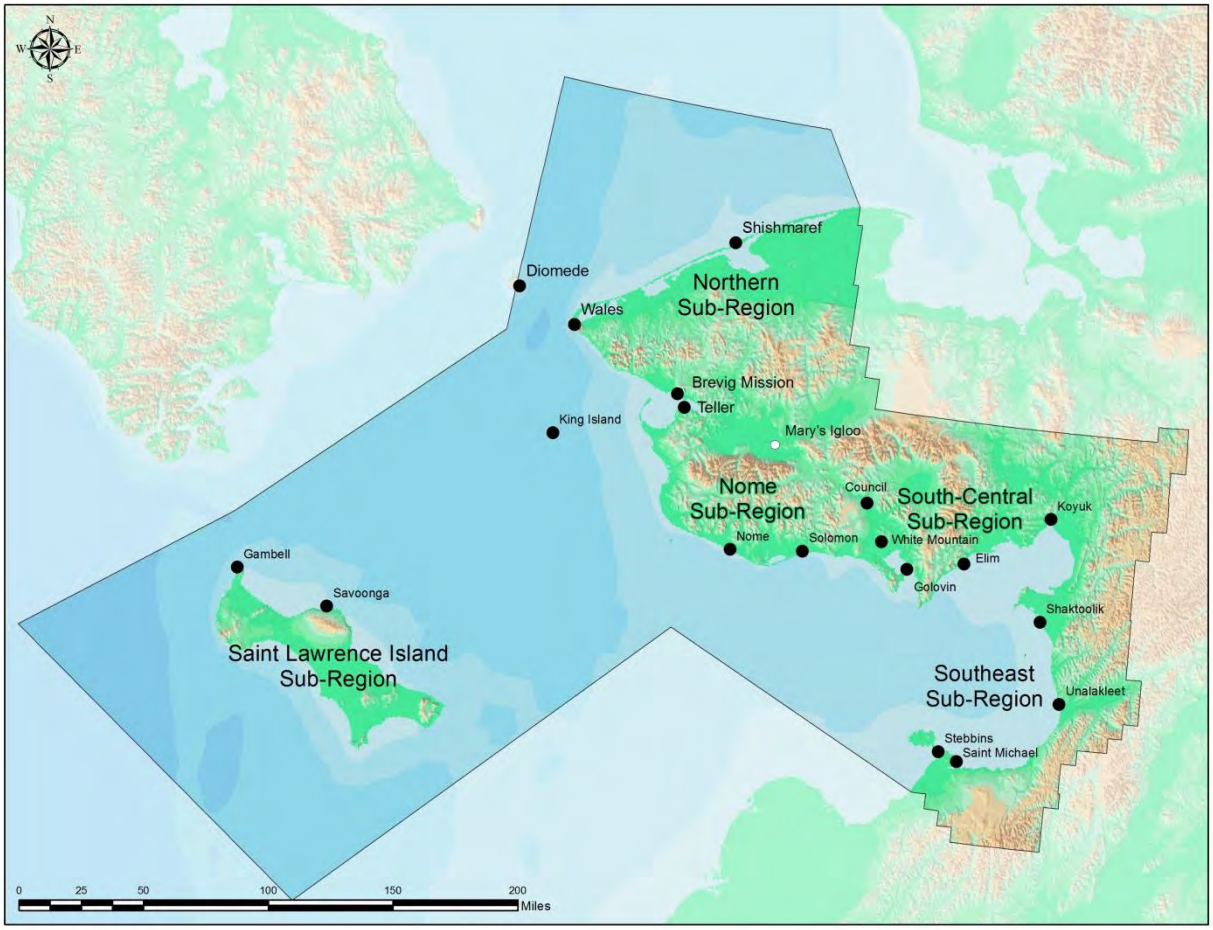
| | | |
|---|---|---|
| **Maintenance and Operations** | | |
| Immediate<br>0-1 year | ■ Train employees for new systems, including water and sewer, housing and power generation.<br>■ | ■ TBD |
| **Energy Infrastructure** | | |
| | ■ Upgrade fuel tanks for safety and capacity. | |
| | ■ Perform upgrades to power generation systems throughout the region. | |
| | ■ Invest in wind generation and solar power wherever feasible. | |
| | ■ Upgrade village power distribution grids. | |
| | ■ Upgrade electric metering. | |
| | ■ Upgrade fuel heater containments. | |
| | ■ Upgrade to more efficient street lighting across the region. | |
| Long<br>>10 years | ■ | |
| **Planning** | | |
| Immediate<br>0-1 year | ■ Adopt an energy element into the local and regional comprehensive plans. | TBD |
| | ■ | TBD |
| Medium<br>5-10 years | ■ Update the Bering Strait Regional Energy Plan on a regular basis. | TBD |
| | ■ | TBD |

# 4 Community Sub-Regional Summaries

The Bering Strait Region has sixteen communities occupied year round and is divided into five sub-regions that coincide with the sub-regions used by Bering Straits Development Council and Kawerak Incorporated. Most of the communities do not have interconnected energy systems, but some of the communities in the sub-regions can be considered energy clusters because of potential or existing interties and similar energy resources.

The sub-regions include the Northern, South-central, Southeast, Saint Lawrence Island and Nome sub-regions. The communities within each sub-region are described below and shown in the overview map in Figure 4-1.

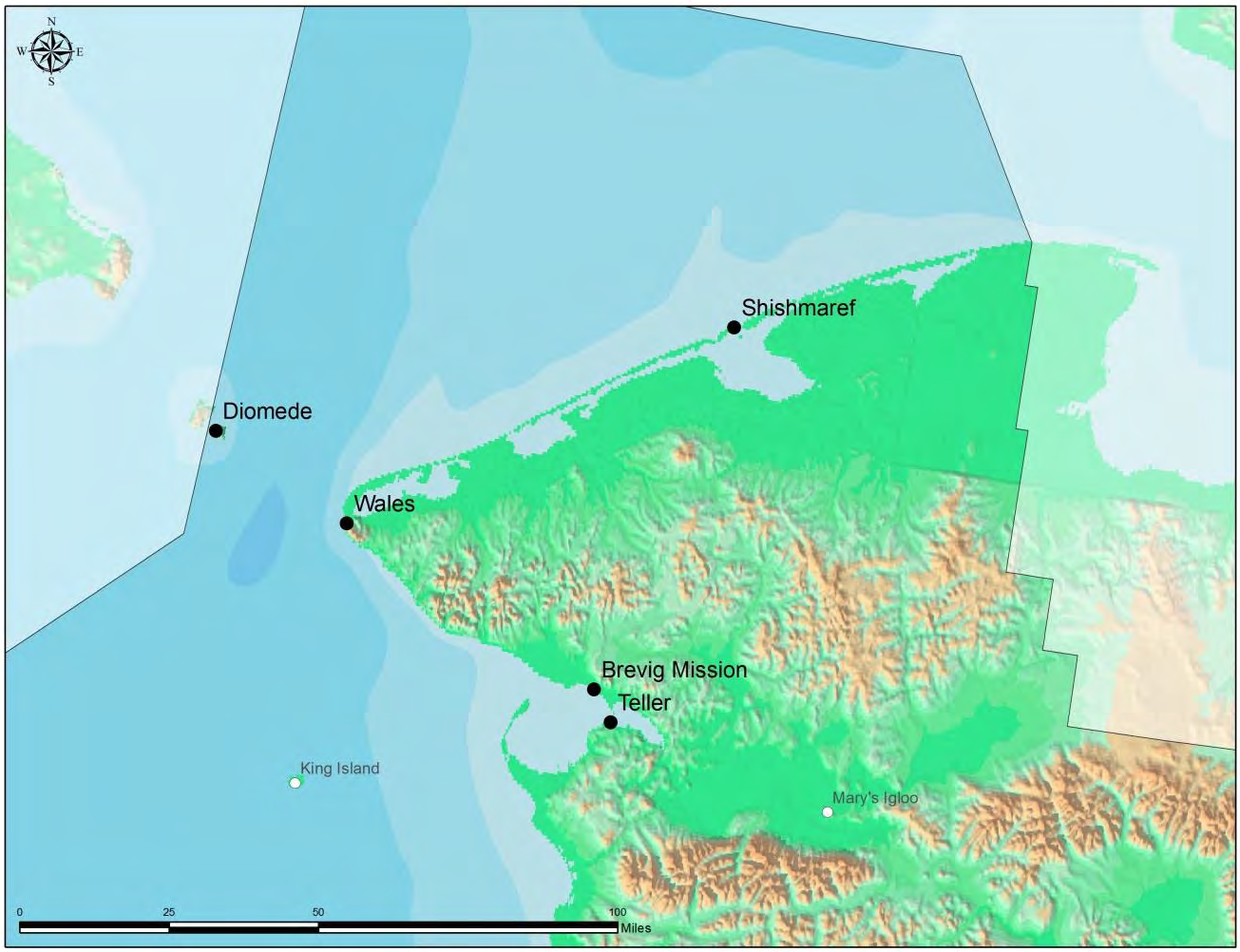
**Figure 4-1: Bering Strait Region, Sub-Regions and Communities**



## 4.1 Northern Sub-Region Profile

The Northern Sub-Region includes Brevig Mission, Diomede, Shishmaref, Teller and Wales. The 2010 U.S. Census reports a total population of 1,440. Teller is 57 miles from Nome and is connected to Nome by road from about June through November. Diomede is located on the island of Little Diomede located 80 miles northwest of Teller and 130 miles northwest of Nome. Figure 4-2 shows the communities in the Northern sub-region.

**Figure 4-2: Northern Sub-Region**



# Brevig Mission

*Community and Energy Profile*

# COMMUNITY PROFILE - Brevig Mission

**Location:** Brevig Mission is located at the mouth of Shelman Creek on Port Clarence, 5 miles northwest of Teller and 65 miles northwest of Nome.

**Longitude/Latitude:** -166 27'56.6"/65 19' 52"

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Cultural Resources:** Brevig Mission is predominantly Inupiat Eskimo with a subsistence lifestyle.

**Alaskan Native Name and Definition:** N/A

**Incorporation:** 2nd Class City, 1969

**Elevation:** 38.1'

**Historical Setting:** A Lutheran mission was constructed at the present site in 1900, and the village became known as "Teller Mission. In 1903, the Brevig Mission post office was established, named after the Rev. T.L. Brevig, an early pastor at the mission. Reindeer were the economic base of this community until 1974.

**Community Plans:** Bering Strait Comprehensive Economic Development Strategy 2013-2018, Brevig Mission Local Economic Development Plan 2007-2012, Local Economic Development Plan 2004, Brevig Mission Land Use and Capital Plan 2003

**Economy:** The people of Brevig Mission subsist upon fish, moose, reindeer, seal, walrus, and beluga whales. Primary employers are the city and school district. Year-round jobs are scarce, unemployment is high, and seasonal jobs limited. Arts and crafts provide some cash income. 153 residents employed: 53 in private sector, 98 in local government, and 2 in state government.

## Local Contacts

City of : City of Brevig Mission, PO Box 100, Brevig Mission, AK 99785; Phone: 907-642-3051; Fax: 907-642-2194; Email: mayor_kts@yahoo.com

Tribal: Native Village of Brevig Mission; P.O. Box 85039; Brevig Mission, AK 99785; Phone: 907-642-4301, Fax: 907-642-2099, Email: tc.kts@kawerak.org

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 276 | 388 | Median Household Income | 21,875 | 34,375 |
| Median Age of Total Population | 19.6 | 22 | Rate of Unemployment | 46.4 | 32.9% |
| Average Household Size | 4.06 | 5 | Total Number of Occupied Housing Units | 68 | 93 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 76 dwelling units, 5 individuals/household | Bering Straits Regional Housing Authority |
| Water/Wastewater | Above ground circulating water system, 2 underground wells. Water treated and stored in 100,000-gallon tank at Washeteria. Gravity buried sewer system and honey bucket haul. | Water is piped into the school from the city's water mains. Water tank filled monthly. |
| Power Generation | Alaska Village Electric Cooperative (AVEC) | Diesel Powered |
| Landfill | Brevig Mission 2 Mile southeast Landfill, Class 3, permitted | |
| Access | Brevig Mission Airport—gravel runway, cargo barge visits annually. | Teller 5 minutes by boat. State maintains 72 mile road from Teller to Nome in summer. |

## Non-Residential Buildings and Facilities Energy Information – (21 buildings)

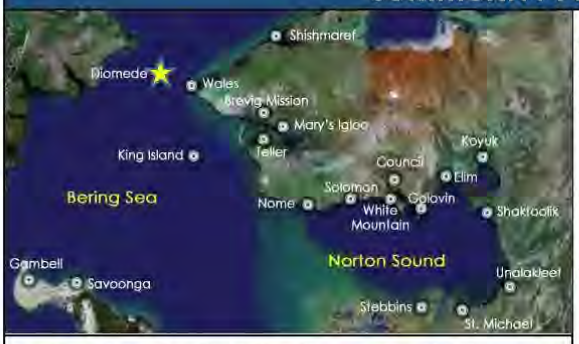
| Name | Notes | Name | Notes |
|---|---|---|---|
| DOT shop | | Mechanical Building | |
| Lutheran Church | | Multipurpose Building | |
| Brevig Mission K-12 School | AHFC Audit/2012 | Other Garage | |
| Store | | Portable Storage | |
| City office | | School Garage | |
| Clinic | | W&S Camp | |
| Community Hall | | Storage Building BIA | |
| Garage | | Storage Building | |
| Voc Ed Wood Shop | | Voc Ed Metal Shop | |
| VPO Office | | Water Treatment Plant | |

| ENERGY PROFILE – Brevig Mission | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | | | |
| | **Make/model** | **Size** | **Condition/Hours** |
| Generator | Detroit/60 | 200 | Fair |
| Generator | Detroit/60 | 325 | Fair |
| Generator | Cat/3456 | 500 | Excellent |
| | | | |
| Heat recovery | Y | | |
| Alternative energy integration ready | Y | | |
| Back Up system | | | |
| Peak electrical load | 288 | | |
| Annual community load (kwh) | 141 | | |
| **Electrical Rates** | | | |
| Production cost (kwh) | .54 | | |
| Residential rate | .58 | | |
| Rate with pce subsidy | .19 | | |
| Commercial rate | | | |
| Fuel per kwh | .27 | | |
| **Retail Fuel Prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 3.53 | N/a |
| Gasoline | | | N/a |
| Propane 100# tank | | 284.69 | N/a |
| Coleman 16.4 oz. Disposable bottle | N/a | N/a | N/a |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | Wind study identified | |
| Solar | Medium | Solar PV at water treatment plant | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Low | | |
| Emerging technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity/# of tanks/type of fuel/condition** | | |
| AVEC | 112,400/13 vertical tanks/Diesel | | |
| Brevig Mission School (BSSD) | 101,000/14 vertical tanks/Diesel | | |
| Brevig Mission Native Corporation | 111,800/9 tanks/Diesel and Gasoline | | |
| Brevig Mission Native Corporation | 26,800/4 horizontal tanks/Gasoline | | |
| Unknown | 3,000/Diesel | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Number of homes** | | |
| Piped Water and Sewer | Approximately 350 customers | | |
| | | | |
| | | | |

# Diomede

*Community and Energy Profile*

# COMMUNITY PROFILE - Diomede




**Location:** Diomede is located on the west coast of Little Diomede Island in the Bering Straits, 135 miles northwest of Nome. It is only 2.5 miles from Big Diomede Island, Russia.

**Longitude/Latitude**: -168.9531/65.7586

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Alaskan Native Name and Definition:** Inalik, "the other one"

**Incorporation:** 2nd Class City, 1970

**Elevation:** 20 ft.

**Historical Setting:** Early Eskimos on the islands worked on the ice and sea and had a culture with elaborate whale hunting ceremonies.. The islands were named in 1728 by Vitus Bering in honor of Saint Diomede. The 1880 Census counted 40 people, all Ingalikmiut Eskimos, The city was incorporated in 1970. Some residents are interested in relocating the village.

**Cultural Resources:** Seal, polar bear, blue crab, and whale meat are the preferred foods. Mainland Natives come to Diomede to hunt polar bears. Seal and walrus hides are used to make parkas, hats, mukluks, furs, and skins for trade.

**Community Plans:** Bering Strait Regional Energy Plan 2014, Diomede Local Economic Development Plan 2012-2017, Bering Strait Comprehensive Economic Development Plan 2013-2018GF

**Economy:** Diomede is a traditional Ingalik Eskimo village with a subsistence lifestyle. The sale and importation of alcohol is banned in the village. 51 residents employed: 7 in private sector, 44 in local government and 0 in state government.

## Local Contacts

**City of Diomede** PO BOX 7039, Little Diomede, AK 99762; Phone: 907-686-3071 Fax: 907-686-2192; Email: dio.city@yahoo.com; Website: http://www.kawerak.org/communities/diomede.html

**Native Village of Diomede:** Native Village of Diomede; P.O. Box 7079; Diomede, AK 99762; Email: fozenna@kawerak.org Website: http://www.kawerak.org

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 146 | 115 | Median Household Income | | $41,667 |
| Median Age of Total Population | 23 | 14 | Rate of Unemployment | | 20.6% |
| Average Household Size | 4 | 4 | Total Number of Occupied Housing units | 38 | 38 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 47 housing units, 4 individuals/household | Bering Straits Regional Housing Authority |
| Water/Wastewater | Small treated water supply, distributed using access hydrants, sewage haul system | Self-haul during winter; tank capacity insufficient during spring, residents thus melt snow and ice for drinking water |
| Power Generation | Diomede Joint Utilities | Diesel Generator |
| Landfill | Diomede Landfill, Class 3, not permitted | |
| Access | Diomede Heliport –good condition, Ice runway in winter when conditions permit | General Aviation Airport13 |

## Non-Residential Buildings and Facilities Energy Information

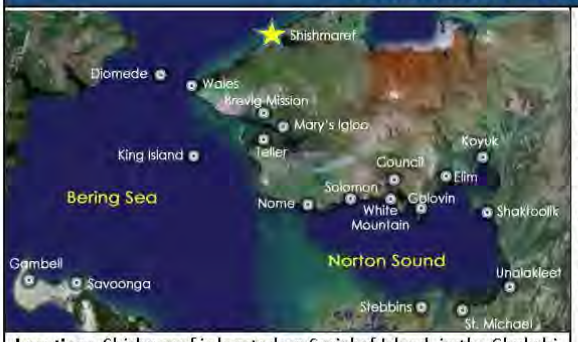
| Name | Notes | Name | Notes |
|---|---|---|---|
| City Office Building | | Tribal Office | |
| Clinic | | Power Plant | |
| Diomede Catholic Church | | Recreation Building | |
| Diomede Native Corp. bldg. | | Shack | |
| Diomede Native Store | | Storage Building | |
| Elem. School Building | | Utility Office | |
| High School Building | | Water Treatment Plant | |
| Mechanical Building | | | |

| ENERGY PROFILE – DIOMEDE | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | | | |
| | **Make/model** | **Size** | **Condition/Hours** |
| Generator | Unknown | 100 | |
| Generator | Unknown | 180 | |
| Generator | Unknown | 180 | |
| | | | |
| Heat Recovery | Y | | |
| Alternative Energy integration ready | | | |
| Back Up System | | | |
| Peak Electrical Load | | | |
| Average Electrical Load | 109 | | |
| Minimum Electrical Load | 49 | | |
| **Electrical Rates** | | | |
| Production Cost (kwh) | .52 | | |
| Residential Rate | .60 | | |
| Rate with PCE subsidy | .46 | | |
| Commercial Rate | | | |
| Fuel per kWh | .47 | | |
| **Retail Fuel Prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 8.65 | N/A |
| Gasoline | | 8.63 | N/A |
| Propane 100# tank | | | N/A |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Low | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity/# of tanks/Fuel type** | **Condition** | |
| City Of Diomede | 160,900 | | |
| City of Diomede | 7,900 | | |
| **Water & Sewer Infrastructure** | | | |
| **System Type** | **Residential** | **Commercial** | |
| Little Diomede Water Supply Water System, Small Treated | 184 | | |
| | | | |
| | | | |

# Shishmaref

*Community and Energy Profile*

# COMMUNITY PROFILE – SHISHMAREF




**Location:** Shishmaref is located on Sarichef Island, in the Chukchi Sea, just north of the Bering Strait. Shishmaref is 5 miles from the mainland, 126 miles north of Nome, and 100 miles southwest of Kotzebue. The village is surrounded by the 2.6 million-acre Bering Land Bridge National Reserve. It is part of the Beringian National Heritage Park.

**Longitude/Latitude:** -166.0719/66.2567

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Alaskan Native Name and Definition:** Kigiktaq meaning "the island"

**Incorporation:** 2nd Class City, 1969

**Elevation:** 13'

**Historical Setting:** In 1816, Lt. Otto Von Kotzebue named the inlet "Shishmarev," after a member of his crew. Shishmaref has an excellent harbor, and around 1900 it became a supply center for gold mining activities to the south. The village was named after the inlet, and a post office was established in 1901. During October 1997, a severe storm eroded over 30 feet of the north shore, requiring 14 homes and the National Guard Armory to be relocated. Five additional homes were relocated in 2002. Other storms have continued to erode the shoreline an average of three to five feet per year on the north shore. In July 2002 residents voted to relocate the community.

**Cultural Resources:** Excavations at "Keekiktuk" by archaeologists around 1821 provided evidence of Inuit habitation from several centuries ago. Subsistence hunting includes: fishing, seals, walrus, beluga, fowl, caribou, reindeer, moose, mush ox and berry picking.

**Community Plans:** Shishmaref Local Economic Development Plan 2013-2018

**Economy:** Shishmaref is a traditional Inupiat village with a fishing and subsistence lifestyle. 222 Residents employed: 91 in private sector, 128 in local government, and 3 in state government.

## Local Contacts

**Native Corp:** Shishmaref Native Corporation, P.O Box 72151, Shishmaref, AK 99772; Phone: 907-649-3751 Fax: 907-649-3731

**City:** City of Shishmaref, PO Box 83, Shishmaref, AK 99772, Phone 907-649-3781 Fax 907-649-2131; Email cityofshhclerk@gci.net

**Tribal:** Native Village of Shishmaref, P.O. Box 72110, Shishmaref, AK 99772; Phone 907-649-3821 Fax 907-649-2104; Email: tc.shh@kawerak.org Website: http://www.kawerak.org

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 562 | 602 (City) | Median Household Income | | $37,500 |
| Median Age of Total Population | 25 | 19 | Rate of Unemployment | | 17.2% |
| Average Household Size | 4 | 4 | Total Number of Housing Units | 148 | 151 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 151 housing units, 4 individuals/household | Bering Straits Regional Housing Authority |
| Water/Wastewater | 95% honey buckets, 5% flush system | City Office, School and Clinic only plumbed buildings |
| Power Generation | AVEC | Class 2 Wind - 3 Wind Turbines installed |
| Landfill | Shishmaref Landfill, Class 3, permitted | |
| Access | Shishmaref Airport, Asphalt | Commercial service |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| City Office | EECBG, VEEP | The Learning Center | |
| Fire Hall | EECBG | Covenant church | |
| Friendship Center | EECBG | Community Hall | |
| Shishmaref School | AHFC | Clinic | |
| DOT shop | | Nayukpuk Store | |
| Native Corporation | | Native Store | |
| Tannery | | School Shop | |
| Tribal Office | | Washeteria | |
| Power Plant | | CATV building | |
| Headstart Building | | Pump House | |
| Tel Alaska Building | | | |

| ENERGY PROFILE – SHISHMAREF | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Condition/Hours** |
| Generator | Detroit/60 | 376 | |
| Generator | Cat/D133E | 300 | |
| Generator | Cummins/ KTA-19-G2 | 400 | |
| Generator | Cummins/ QSX15-G9 | 500 | |
| | | | |
| Heat Recovery | Yes | | |
| Alternative Energy integration ready | | | |
| Back Up System | Yes | | |
| Peak Electrical Load | 524 | | |
| Average Electrical Load | | | |
| Annual community load (kwh) | 1,646,878 | | |
| **Electrical rates** | | | |
| Production Cost (kwh) | .65 | | |
| Residential Rate | .60 | | |
| Rate with PCE subsidy | .19 | | |
| Commercial Rate | | | |
| Fuel per kWh | .37 | | |
| **Retail fuel prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 5.79 | |
| Gasoline | | 6.50 | |
| Propane 100# tank | | 386.00 | |
| Coleman 16.4 oz. Disposable Bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | 2 Wind Turbines Installed (inop) | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Low | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity** | **Condition** | |
| City of Shishmaref | 87,500 | | |
| Shishmaref Native Store | 55,800 | | |
| Shishmaref Native Store | 68,200 | | |
| Nayokpuk General Store | 27,000 | | |
| Nayokpuk General Store | 54,000 | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Shishmaref Water Treatment System | | 3 | |
| Shishmaref Wastewater Treatment System | | 3 | |
| | | | |

# Teller

*Community and Energy Profile*

# COMMUNITY PROFILE – TELLER

**Location:** Teller is located on a spit between Port Clarence and Grantley Harbor, 72 miles northwest of Nome, on the Seward Peninsula.

**Longitude/Latitude:** -166.3608/65.2636

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Teller is a traditional Kawerak Eskimo village with a subsistence lifestyle. Seals, beluga whales, fish, reindeer, and other local resources are utilized. A herd of reindeer roam the area. The sale and importation of alcohol is banned. 103 residents employed: 29 in private sector, 73 in local government, and 1 in state government.

**Economy:** Bering Strait

**Alaskan Native Name and Definition:**

**Incorporation:** 2nd Class City, 1963

**Elevation:** 294'

**Historical Setting:** A Western Union Telegraph expedition wintered at the present site in 1866 and 1867; it was then called "Libbyville" or "Libby Station." The Teller Reindeer Station was operated by the U.S. Government at a nearby site from 1892 to 1900. The station was named in 1892 by Sheldon Jackson for U.S. Senator and Secretary of the Interior Henry Moore Teller. Teller Mission, a Norwegian Evangelical Lutheran mission, was built in 1900 across the harbor at the current site of Brevig Mission. Present-day Teller was also established in 1900 after the Bluestone Placer Mine discovery 15 miles to the south. During these boom years, Teller had a population of about 5,000 and was a major regional trading center, attracting Natives from Diomede, Wales, Mary's Igloo, and King Island.

**Cultural Resources:** Many residents today were originally from Mary's Igloo.

**Community Plans:** Teller Local Economic Development Plan 2013-2018

## Local Contacts

**Borough:** Teller Native Corporation; P.O. Box 649, Teller, AK 99778; Phone: 907-642-6132 Fax: 907-642-6133

**City:** City of Teller; PO Box 548, Teller, AK 99778; Phone: 907-642-3401 Fax: 907-642-2051; Email: cityofteller@gmail.com

**Tribal:** Native Village of Teller; P.O. Box 567, Teller, AK 99778; Phone: 907-642-3381 Fax: 907-642-2072 Email: cisabell@kawerak.org
Website: http://www.kawerak.org/tribalHomePages/teller/index.html

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 268 | 229 | Median Household Income | | $27,250 |
| Median Age of Total Population | 24 | 23 | Rate of Unemployment | | 15.06% |
| Average Household Size | 4 | 4 | Total Number of Housing Units | 87 | 86 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 86 Total, 72 Occupied, 14 Vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Bering St SD - Teller School/Wash Water System, small treated | Population Served: 295 |
| Power Generation | AVEC | Diesel Generator |
| Landfill | Teller Landfill, Class 3, permitted | |
| Access | Teller Airport, gravel, fair condition | General Aviation Airport |
| | | |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| City Community Hall | EECBC | Duplex Teacher Housing | VEEP |
| City Office | EECBC | Teller Trad. Council Office | VEEP |
| City Maintenance Garage | EECBC | New Clinic | VEEP |
| BSSD Maintenance | VEEP | Storage Building | VEEP |
| Old Elementary 4-plex | VEEP | | |
| Washeteria | EECBC | | |
| School Bus Garage | VEEP | | |

| ENERGY PROFILE – TELLER | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Condition/Hours** |
| Generator | Cat/3304 | 124 | |
| Generator | Cat/3208 | 156 | |
| Generator | Cat/2406 DTTA | 297 | |
| Generator | Cat/3306 PC | 150 | |
| Generator | Cat/3304 | 87 | |
| Generator | Detroit/60 | 236 | |
| | | | |
| Heat Recovery | Y | | |
| Alternative Energy integration ready | | | |
| Back Up System | | | |
| Peak Electrical Load | 186 | | |
| Average Electrical Load | | | |
| Annual community load (kwh) | 99 | | |
| **Electrical rates** | | | |
| Production Cost (kwh) | .60 | | |
| Residential Rate | .64 | | |
| Rate with PCE subsidy | .20 | | |
| Commercial Rate | | | |
| Fuel per kWh | .33 | | |
| **Retail fuel prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 5.13 | |
| Gasoline | | 5.81 | |
| Propane 100# tank | | | |
| Coleman 16.4 oz. Disposable Bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | 3 Wind Turbines | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Low | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity** | **Condition** | |
| AVEC | 199,400 | | |
| James C. Isabell School, Bering Strait School District | 66,400 | | |
| Teller Native Corporation | 66,500 | | |
| Teller Native Corporation | 16,000 | | |
| | | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Bering St SD - Teller Sc/Wash Water System | 295 | | |
| Honey-Bucket | 42 | | |
| | | | |

# Wales

*Community and Energy Profile*

# COMMUNITY PROFILE – WALES

**Location:** Wales is located on Cape Prince of Wales, at the western tip of the Seward Peninsula, 111 miles northwest of Nome.

**Longitude/Latitude:** -168.0875/65.6092

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** Wales is a traditional Kawerak Eskimo village with a subsistence lifestyle. Seals, beluga whales, fish, reindeer, and other local resources are utilized. A herd of reindeer roam the area. The sale of alcohol is banned in the village.

**Incorporation:** 2nd Class City, 1964

**Elevation:** 294'

**Historical Setting:** A burial mound of the "Birnirk" culture (500 A.D. to 900 A.D.) was discovered near Wales and is now a national landmark. In 1827 the Russian Navy reported the Eskimo villages of "Eidamoo" near the coast and "King-a-ghe" further inland. In 1890 the American Missionary Association established a mission here, and in 1894 a reindeer station was organized. A post office was established in 1902. Wales became a major whaling center due to its location along migratory routes, and it was the region's largest and most prosperous village, with more than 500 residents. The influenza epidemic in 1918-19 claimed the lives of many of Wales' finest whalers.

**Cultural Resources:** Wales people refer to themselves as Kingikmiut, "the people of Kingigin." Wales was also one of the largest villages in the region in pre-historical and post-contact times with population estimates between 500 - 600 people. The village population was decimated by epidemics of disease over the years. The Spanish Influenza epidemic of 1918 reduced the population by approximately one-half.

**Community Plans:** Economic Development Plan 2004-2009

## Local Contacts

**Village Corporation:** Wales Native Corporation Box 529 Wales, Alaska 99783 Phone: 907-664-3641

**City:** City of Wales Box 489 Wales, Alaska 99783 Phone: 907-664-3501 Fax: 907-664-2359 Email: cityofwalesclerk@yahoo.com

**Tribal:** Native Village of Wales Box 549 Wales, Alaska 99783 Phone: 907-664-362 Email: tc.waa@kawerak.org

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 152 | 145 | Median Household Income | | $31,250 |
| Median Age of Total Population | 26 | 24 | Rate of Unemployment | | 25% |
| Average Household Size | 4 | 4 | Total Number of Housing Units | 59 | 51 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 51 total, 43 occupied, 8 vacant | Bering Straits Housing Authority |
| Water/Wastewater | Small treated, operated by Wales Water System | |
| Power Generation | AVEC owned and operated, PCE subsidized | 3 wind turbines installed (inoperable – owned by KEA) |
| Landfill | Wales Landfill, Class 3, not permitted | |
| Access | Wales Airport, gravel, good condition | General aviation airport |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| School | | Church storage | |
| Clinic | | AVEC Powerhouse | |
| Native Store (ANICA) | | Washeteria and City Bldg. | |
| Native Corp Store | | DOT shop | |
| Multi-purpose Building | | Erickson Helicopter Connex | |
| Post Office | | | |
| Geo Dome (vacant w/ w/s, elec.) | | | |
| Church | | | |
| Teacher Housing (4-plex) | | | |

# ENERGY PROFILE – WALES

## Power Production

| | | | |
|---|---|---|---|
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Year** |
| Generator – Kato 6P4-1088 | Cummins LTA10 | 168 | |
| Generator – Newage HC1634GIL | Detroit Series 60 | 236 | |
| Generator – Kato 6P4-1050 | Cummins LTA10 | 168 | |
| | | | |
| Heat Recovery | Installed but not operable | | |
| Alternative Energy integration ready | Yes – 2 AOC 50 wind turbines inoperable | | |
| Back Up System | Yes | | |
| Peak Electrical Load | 152 (2005) | | |
| Annual community load (kwh) | 620,579 | | |
| Minimum Load | 71 Average Load | | |

## Electrical rates

| | |
|---|---|
| Production Cost (kwh) | .64 |
| Residential Rate | .69 |
| Rate with PCE subsidy | .20 |
| Commercial Rate | |
| Fuel per kWh | .36 |

## Retail fuel prices

| | **Commercial** | **Residential** | **Senior** |
|---|---|---|---|
| Diesel | | $6.00 | |
| Gasoline | | $7.15 | |
| Propane 100# tank | | | |
| Coleman 16.4 oz. Disposable Bottle | | | |

## Alternative Energy

| **Source** | **Potential** | **Projects** |
|---|---|---|
| Wind diesel | High – Class 6-7 | 2 AOC 50 wind turbines inoperable |
| Solar | Medium | |
| Coal | Low | |
| Hydroelectric | Low | |
| Geothermal | Low | |
| Biomass | Low | |
| Emerging Technologies | Unknown | |

## Bulk Fuel Tank Farm Inventory

| **Tank owner** | **Tank capacity/# tanks/type of fuel/condition** |
|---|---|
| AVEC | 62,827/Diesel |
| | |
| | |
| | |
| | |

## Water & Sewer Infrastructure

| **System type** | **Residential** | **Commercial** |
|---|---|---|
| Wash water haul system | Approximately 150 | |
| Honey-Bucket | Approximately 150 | |
| Piped drinking water | | 3 - Clinic, School, City office |
| Septic system | | 2 – School, Clinic/City/Housing unit |

### 4.1.1 Energy Issues

In 2011, AVEC completed a 6.5-mile intertie between Brevig Mission and Teller. Before AVEC was able to energize the line, an epic storm damaged the cable making the system inoperable. AVEC requested Federal Emergency Management Administration (FEMA) funds to replace the cable and is awaiting approval for funding.

Another energy issue is that the wind turbines in Wales are no longer functioning. The wind turbines were oversized for the community. AVEC provides the electrical services in Wales but the wind turbines are owned by Kotzebue Electric Association. AVEC is coordinating with KEA to discuss removing the old turbines and eventual replacement with turbines better suited for the application.

Diomede has wind energy potential but has challenges due to sensitive bird habitat. Diomede faces the greatest transportation challenges in the Bering Strait Region due to its lack of an airstrip and poor weather. Cargo barge stops are irregular. This impacts the community's ability to respond to energy (and other) emergencies.

The energy champions in this sub-region stated in the SAG meetings that there is a lack of energy efficient housing, home energy audits and energy efficiency education. SAG representatives also indicated a need to build the capacity of energy project / proposal development and administration skills in the region. Currently, community entities separately employ individuals to develop grant proposals to fund priority projects. Typically these positions are created and staffed as needed; however, funding is unavailable to ensure full-time employment. Continual turnover and lack of job security both contribute the underdeveloped capacity of local skill sets in project development and administration.

## 4.2 South-Central Sub-Region Profile

The South-Central sub-region includes Elim, Golovin, Koyuk and White Mountain. This sub-region has rolling hills and small stands of trees. The four communities that make up this sub-region are on the north side of Norton Sound and are either on the coast or near it. Koyuk is the furthest to the east at the head of Norton Bay. Winter trails connect these villages and include part of the Iditarod Trail race checkpoint system. The communities have no roads between them and range from 62 miles (White Mountain) to 130 miles (Koyuk) from Nome which is accessed by air.

Figure 4-3 shows the communities in the South central sub-region.

### Figure 4-3: South-Central Sub-Region

# Elim

*Community and Energy Profile*

# COMMUNITY PROFILE – ELIM

**Location:** Elim is located on the northwest shore of Norton Bay on the Seward Peninsula, 96 miles east of Nome. It lies 460 miles northwest of Anchorage.

**Longitude/Latitude:** -162.2606/64.6175

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** Elim is a Yupik Eskimo village with a fishing and subsistence lifestyle. 138 residents employed: 43 in private sector, 93 local government, and 2 in state government.

**Alaskan Native Name and Definition:**

**Incorporation:** 2nd Class City, 1970

**Elevation:** 162'

**Historical Setting:** This settlement was formerly the Malemiut Inupiat Eskimo village of Nuviakchak. The Native culture was well-developed and well-adapted to the environment. Each tribe possessed a well-defined subsistence harvest territory. The area became a federal reindeer reserve in 1911. In 1914, Rev. L.E. Ost founded a Covenant mission and school, called Elim Mission Roadhouse. When the Alaska Native Claims Settlement Act (ANCSA) was passed in 1971, Elim decided not to participate and instead opted for title to the 298,000 acres of land in the former Elim Reserve. The Iditarod Sled Dog Race passes through Elim each year.

**Cultural Resources:** Solomon is currently a subsistence-use area used by descendants of the families that once resided here. Subsistence activities include: fishing, seals, walrus, beluga, crab, halibut, salmon, fowl, caribou, reindeer and moose.

**Community Plans:** Elim Local Economic Development Plan 2012-2017

## Local Contacts

**Native Corporation:** Elim Native Corporation Box 39010 Elim, Alaska 99739 Phone: 907-890-3741 Fax: 907-890-3091

**City of:** City of Elim, PO Box 39009, Elim, AK 99739; Phone: 907-890-3441 Fax: 907-890-3811; Email: cityofelim@yahoo.com;

**Tribal:** Native Village of Elim; P.O. Box 39070, Elim, AK 99739; Phone: 907-890-3737; Fax: 907-890-3738; Email: eli.tc@kawerak.org;

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 313 | 330 | Median Household Income | | $36,250 |
| Median Age of Total Population | 24 | 26 | Rate of Unemployment | | 24.4% |
| Average Household Size | 4 | 4 | Total Number of Housing Units | 106 | 105 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 105 Total, 89 Occupied, 16 Vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Elim Water Supply Water System | 4 honey bucket haul systems |
| Power Generation | AVEC | Diesel generator |
| Landfill | City owned | Permitted Class 3 |
| Access | Elim Airport—gravel, good condition | General aviation airport |
| | Moses Airport—gravel | Private airport, Owner: Elim Native Corporation |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| Elim Aniguiin School | AHFC | Native Store Warehouse | |
| City Office | | Elim IRA Office | |
| Native Store | | Johnny's Corner Store | |
| City Library | | Elim Clinic | |
| Elim Native Corporation | | Headstart | |
| Covenant Church | | Teacher Housing 4-plex | |
| Water Plan | | School Shop | |
| City Shop | | Fire Hall/Code Red bldg.. | |
| Mukluk Telephone Building | | NSEDC Office | |
| Boys & Girls Club | | DOT shop | |
| FAA Quarters | | New Well House | |
| City Rental Units | | | |

# ENERGY PROFILE – ELIM

| Power Production | | | |
|---|---|---|---|
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Year/Condition/Hours** |
| Generator | Detroit 60 | 200 | 2002 |
| Generator | Detroit 60 | 350 | 2002 |
| Generator | Detroit MTU SV2000 | 500 | 2002 |
| | | | |
| Heat recovery | Y | | |
| Alternative Energy integration ready | | | |
| Back Up system | | | |
| Peak Electrical Load (kWh) | 1,105 | | |
| Annual Community Load (kWh) | 1,145,419 | | |
| Minimum Electrical Load | | | |
| **Electrical Rates** | | | |
| Production cost (kwh) | .59 | | |
| Residential rate | .60 | | |
| Rate with PCE subsidy | .19 | | |
| Commercial rate | | | |
| Fuel per kwh | .32 | | |
| **Retail Fuel Prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 4.47 | |
| Gasoline | | 5.99 | |
| Propane 100# tank | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | | **Projects** |
| Wind diesel | High, Class | | Wind study, completion anticipated in June 2014 |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Medium | | Biomass-burning boiler monitoring |
| Emerging technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity/# tanks/type of fuel** | | |
| AVEC | 135,000 | | |
| School | 57,410 | | |
| City of Elim | 87,000 | | |
| Native Corp | 12,000 | | |
| | | | |
| **Water & Sewer Infrastructure** | | | |
| Utility owner/operator | | | |
| **System type** | **Residential** | | **Commercial** |
| Small Treated, Piped | 75 | | |
| | | | |
| | | | |

# Golovin

*Community and Energy Profile*

# COMMUNITY PROFILE – Golovin

**Location:** Golovin is located on a point of land between Golovin Bay and Golovin Lagoon on the Seward Peninsula. It is 70 miles east of Nome.

**Longitude/Latitude:** -163.0292/64.5433

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** Golovin is an Inupiat Eskimo village with a fishing, herding, and subsistence lifestyle. 92 residents employed, 43 in private sector, 49 in local government, and 0 in state government.

**Alaskan Native Name and Definition:** Chinik

**Incorporation:** 2nd Class City, 1971

**Elevation:** 59'

**Historical Setting:** Golovin was named for Captain Vasili Golovin of the Russian Navy. In 1887, the Mission Covenant of Sweden established a church and school south of the current site. Around 1890, John Dexter established a trading post that became the center for prospecting information for the entire Seward Peninsula. When gold was discovered in 1898 at Council, Golovin became a supply point for the gold fields. Supplies were shipped from Golovin across Golovin Lagoon and up the Fish and Niukluk Rivers to Council. A post office was opened in 1899.

**Cultural Resources:** The Eskimo village of "Chinik," located at the present site of Golovin, was originally settled by the Kauweramiut Eskimos who later mixed with the Unaligmiut Eskimos. Reindeer herding was an integral part of the missions in the area in the 1900s.

**Community Plans:** Golovin Local Economic Development Plan 2009-2013; Multi-Hazard Mitigation Plan 2008

## Local Contacts

**Native Corp:** Golovin Native Corporation; PO Box 62099, Golovin, AK 99762; Phone: 907-779-3251 Fax: 907-779-3261

**City of:** City of Golovin, P.O. Box 62059, Golovin, AK 99762; Phone: 907-779-3681 Fax: 907-779-2239; Email: golovin_ak@hotmail.com

**Tribal:** Chinik Eskimo Community; P.O. Box 62020, Golovin, AK 99762; Phone: 907-779-2214 Fax: 907-779-2829; Email: dbrown@kawerak.org

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 144 | 171 | Median Household Income | | $32,188 |
| Median Age of Total Population | 26 | 30 | Rate of Unemployment | | 22.5% |
| Average Household Size | 4 | 4 | Total Number of Housing Units | 45 | 49 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 49 total, 49 occupied, none vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Golovin Community Water System, small treated | |
| Power Generation | Golovin Power Utilities | Diesel generator |
| Landfill | Golovin 1.7 Mile North Landfill, Class 3, permitted | City of Golovin Owned |
| Access | Golovin Airport—gravel, good condition | General Aviation Airport |

## Non-Residential Buildings and Facilities Energy Information

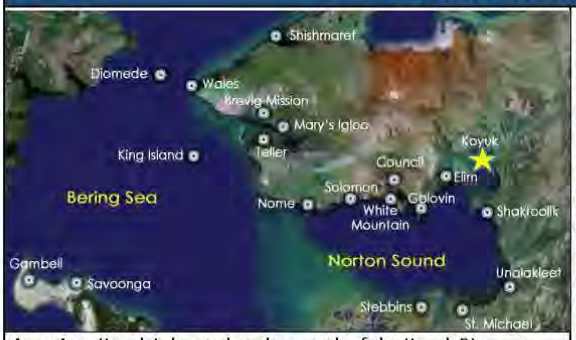
| Name | Notes | Name | Notes |
|---|---|---|---|
| Chinik Tribal Building | | School Shop (old) | |
| City Office | | School Shop (new) | |
| High School | | Old church (storage) | |
| City Shop | | NSEDC building | |
| Elementary School | | Covenant Church | |
| Fire Hall | | Washeteria | |
| Code Red building | | Post Office | |
| Clinic | | DOT shop | |
| ANICA Chinik Store | | VPSO building | |
| Old Clinic | | Power Plant | |
| Water Treatment Plant | | GCI building | |

| ENERGY PROFILE – GOLOVIN | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | Golovin Power Utilities | | |
| | **Make/model** | **Size** | **Year** |
| Generator | Deere/ 6068TF250 | 115 | |
| Generator | Deere/ 6068TF250 | 115 | |
| Generator | Deere/ 6081AFM75 | 150 | |
| Generator | Deere/6081T | 200 | |
| | | | |
| Heat recovery | Y | | |
| Alternative energy integration ready | | | |
| Back Up system | | | |
| Peak electrical load | 141 | | |
| Annual community load (kwh) | 678,300 | | |
| **Electrical rates** | | | |
| Production cost (kwh) | .53 | | |
| Residential rate | .60 | | |
| Rate with PCE subsidy | .33 | | |
| Commercial rate | .27 | | |
| Fuel per kwh | .33 | | |
| **Retail fuel prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 5.00 | |
| Gasoline | | 5.00 | |
| Propane 100# tank | | | |
| Coleman 16.4 oz. Disposable bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | Medium to High | Met Tower Pending | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Medium | | |
| Emerging technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity** | | |
| City of Golovin | 12,000 | | |
| City of Golovin | 123,500 | | |
| City of Golovin | 28,700 | | |
| Martin L. Olson School | 51,400 | | |
| | | | |
| **Water & Sewer Infrastructure** | | | |
| **SYSTEM TYPE** | **Residential** | **Commercial** | |
| Small Treated | 150 | 200 | |
| Truck Water | 25 | | |
| Honey Buckets | 25 | | |
| Pit Privies | 21 | | |

# Koyuk

*Community and Energy Profile*

# COMMUNITY PROFILE – Koyuk




**Location:** Koyuk is located at the mouth of the Koyuk River, at the northeastern end of Norton Bay on the Seward Peninsula, 90 air miles northeast of Nome.

**Longitude/Latitude:** -161.1569/64.9319

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** Residents maintain a subsistence lifestyle. 157 residents employed: 58 in private sector, 99 in local government, and 0 in state government.

**Alaskan Native Name and Definition:** Kuuyuk, meaning "where the river meets the sea".

**Incorporation:** 2nd Class City, 1970

**Elevation:** 161.5'

**Historical Setting:** The site of "Iyatayet", 40 miles SW, on Cape Denbigh to the south has traces of human habitation that are 6,000 to 8,000 years old. Villagers were historically nomadic. Lt. Zagoskin of the Russian Navy noted the village of "Kuynkhak-miut" here in 1842-44. A Western Union Telegraph expedition in 1865 found the village of "Konyukmute." Around 1900, the present townsite, where supplies could easily be lightered to shore, began to be populated. Two boomtowns grew up in the Koyuk region around 1914: Dime Landing and Haycock. The "Norton Bay Station," 40 miles upriver, was established to supply miners and residents in 1915. In addition to gold, coal was mined a mile upriver to supply steam ships and for export to Nome. The first school began in the church in 1915; the U.S. Government built a school in Koyuk in 1928.

**Cultural Resources:** Koyuk is a traditional Unalit and Malemiut Eskimo village who people speak a dialect of Inupiat Eskimo. Subsistence hunting includes: fishing, seals, walrus, beluga, fowl, caribou, moose, reindeer and musk ox.

**Community Plans:** Local Economic Development Plan 2012-2017

## Local Contacts

**Borough:** Koyuk Native Corporation; PO Box 53050; Koyuk, AK 99753; Phone: 907-963-2424 Fax: 907-963-3352

**City of:** City of Koyuk; PO Box 53029, Koyuk, AK 99753; Phone: 907-963-3441 Fax: 907-963-3442; Email: cityofkoyuk@hughes.net

**Tribal:** Native Village of Koyuk; P.O. Box 53030, Koyuk, AK 99753; President; Phone: 907-963-3651 Fax: 907-963-2353; Email: tc.kka@kawerak.org

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 297 | 332 | Median Household Income | | $24,250 |
| Median Age of Total Population | 25 | 24 | Rate of Unemployment | | 24.4% |
| Average Household Size | 4 | 4 | Total Number of Housing Units | 95 | 99 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 99 Total, 89 Occupied, 10 Vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Koyuk Public Water System, small treated | Population served: 277 |
| Power Generation | AVEC | Diesel generator |
| Landfill | Koyuk Landfill, Class 3, not permitted | |
| Access | Koyuk Alfred Adams Airport, gravel, fair condition | General Aviation Airport |
| | | |

## Non-Residential Buildings and Facilities Energy Information

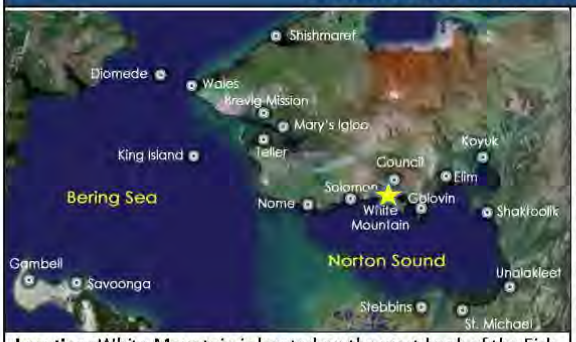
| Name | Notes | Name | Notes |
|---|---|---|---|
| City Office | EECBG | Health Clinic | |
| Koyuk-Malemut School | AHFC | Headstart | |
| City Library | | City Rec Center | |
| Public Safety Building | | Tel Alaska building | |
| VPSO Housing | | GCI | |
| BSSD Housing unit | | Native Corp. building | |
| IRA building | | Native Store (ANICA) | |
| Code Red building | | Native Store Storage | |
| DOT shop | | Water Treatment Plant | |
| City shop | | Power Plant | |
| FAA Weather Station building | | | |

| ENERGY PROFILE – KOYUK | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Year** |
| Generator | Detroit/60 | 325 | |
| Generator | Detroit/60 | 325 | |
| Generator | Cummins/ QSX15-09 | 500 | |
| | | | |
| Heat Recovery | Y | | |
| Alternative Energy integration ready | | | |
| Back Up System | | | |
| Peak Electrical Load | 147 | | |
| Annual community load (kwh) | 1,324,557 | | |
| **Electrical rates** | | | |
| Production Cost (kwh) | .57 | | |
| Residential Rate | .60 | | |
| Rate with PCE subsidy | .19 | | |
| Commercial Rate | | | |
| Fuel per kWh | .30 | | |
| **Retail fuel prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 6.31 | |
| Gasoline | | 5.93 | |
| Propane 100# tank | | | |
| Coleman 16.4 oz. Disposable Bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | Medium to High | Feasibility study on hold | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Medium | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity** | | |
| City and Tribe co-owners | 135,000 | | |
| City and Tribe co-owners | 93,000 | | |
| City and Tribe co-owners | 120,000 | | |
| | | | |
| | | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Circ | 70 | 150 | |
| Gravity | 70 | 150 | |
| Piped Water and Sewer (5% honey buckets) | 51 | | |

# White Mountain

*Community and Energy Profile*

# COMMUNITY PROFILE – WHITE MOUNTAIN




**Location:** White Mountain is located on the west bank of the Fish River, near the head of Golovin Lagoon, on the Seward Peninsula. It is 63 miles east of Nome.

**Longitude/Latitude:** -163.4056/64.6814

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Alaskan Native Name:** Nutchirviq, meaning "to look around the point".

**Incorporation:** 2nd Class City, 1969

**Elevation:** 267'

**Historical Setting:** The Inupiat fish camp of "Nutchirviq" was located here. The bountiful resources of both the Fish and Niukluk Rivers supported the area's Native populations. White Mountain grew after the influx of prospectors during the gold rush of 1900. The first structure was a warehouse built by miner Charles Lane to store supplies for his claim in the Council District. It was the site of a government-subsidized orphanage, which became an industrial school in 1926. A post office was opened in 1932.

**Cultural Resources:** White Mountain is a Kawerak Eskimo village, with historical influences from the gold rush.

**Community Plans:** White Mountain Local Economic Development Plan 2013-2018, Solid Waste Management Plan, 2015.

**Economy:** Subsistence activities are prevalent and include: fishing, seal, walrus, beluga, fowl, caribou, moose, reindeer, musk ox and berry picking. 25% are privately employed and 65% are local government employed.

## Local Contacts

**Borough:** White Mountain Native Corporation; P.O. Box 81, White Mountain, AK 99784; Phone: 907-622-5003 Fax: 907-622-5004

**City of:** City of White Mountain; P.O. Box 130, White Mountain, AK 99784; Daniel Harrelson, Mayor;

**Tribal:** Native Village of White Mountain; P.O. Box 84090, White Mountain, AK 99784; Phone: 907-638-3651 Fax: 907-638-3652; Email: dbarr@kawerak.org Website: http://www.kawerak.org

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 203 | 176 | Median Household Income | | $35,000 |
| Median Age of Total Population | 30 | 29 | Rate of Unemployment | | 15.1% |
| Average Household Size | 3 | 3 | Total Number of Housing Units | 75 | 79 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 80 Total, 72 Occupied, 8 Vacant (2 not livable) | Bering Straits Regional Housing Authority |
| Water/Wastewater | White Mountain Water Treatment System, Small Treated | Population served: 210 – 70 served both residential and commercial |
| Power Generation | City of White Mountain | Diesel generator |
| Landfill | White Mountain Landfill, Class 3, permitted | |
| Access | White Mountain Airport, gravel, good condition | General aviation airport |
| | | |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| Water Treatment Plant | EECBG | Covenant Church | |
| BSSD school | | Environmental Building | |
| ITC/IRA Office | RBEG | DOT Shop | |
| Health Clinic | | | |
| Native Store (ANICA) | | | |
| Public Safety Building | | | |
| City Office | | | |
| Power House | | | |
| School Shop | | | |

| ENERGY PROFILE – WHITE MOUNTAIN | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | White Mountain Utilities | | |
| | **Make/model** | **Size** | **Condition/Hours** |
| Generator | Cat/C6.6 | 157 | 9600 hours/okay |
| Generator | Deere/4.5 | 125 | 160 hours/good |
| Generator | Deere/ 6101AF010 9L | 225 | 4240 hours/good |
| | | | |
| Heat Recovery | Y, Public Safety building, Waterline | | |
| Alternative Energy integration ready | | | |
| Back Up System | | | |
| Peak Electrical Load | 175 | | |
| Annual community load (kwh) | 758,500 | | |
| **Electrical rates** | | | |
| Production Cost (kwh) | .51 | | |
| Residential Rate | .62 | | |
| Rate with PCE subsidy | .3389 | | |
| Commercial Rate | | | |
| Fuel per kWh | .33 | | |
| **Retail fuel prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 4.85 | |
| Gasoline | | 5.25 | |
| Propane 100# tank | | 374.99 | |
| Coleman 16.4 oz. Disposable Bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | Medium | MET Tower Pending | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Medium | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity** | **Condition** | |
| White Mountain Utilities | 138,000 | | |
| White Mountain School, Bering Strait School District | 46,000 | | |
| White Mountain Native Village | 46,000 | | |
| White Mountain Native Village | 46,000 | | |
| Storage | 34,000 | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Circulating | 210 | | |
| Gravity | | | |
| Piped Water and Sewer (5% honey buckets) | 59 | | |

### 4.2.1 Energy Issues

Interties are made more difficult because there are four villages in this Sub-Region and three different electricity providers; which makes coordination between the entities more challenging. At the SAG meetings, participants cited a need for improved communication.

The community of Elim has identified the need to renovate the electrical system and to upgrade electrical systems in older houses to assist residents with energy needs. Along with the new wood-fired boiler for the clinic funded by ANTHC, a hydroelectric dam has been analyzed as a way to provide alternative energy for the community. The community has also been applying to AEA for funds to complete a feasibility study to examine nearby geothermal potential. The known geothermal springs near Elim, called Elim Hot Springs or Kwiniuk Hot Springs, is located approximately 8 miles inland from the community, and Clear Creek Hot Springs located approximately 15 miles northwest from the community. AEA has indicated they would consider a request to study the Elim area hot springs as a pilot project to determine the feasibility of a small scale geothermal project working in a remote Alaskan community. NSEDC has indicated they would consider installing a fish hatchery in Elim if energy was cheap enough.

AT the SAG meetings, the Golovin energy champion identified that they need to relocate the generator building to higher ground, investigate alternative energy sources such as wind and renovate older homes for energy efficiency.

Residents of Koyuk would like to upgrade existing housing for energy efficiency and ensure new construction meets 5 star energy efficiency standards.

White Mountain recently upgraded their power plant and the energy champion indicated they would like to capture waste heat and explore alternative energy. Existing lines and poles need maintenance.

## 4.3 Southeast Sub-Region

The Southeast Sub-Region includes the communities of Shaktoolik, Stebbins, Saint Michael and Unalakleet. These coastal communities are located along Norton Sound and range from 120 to 148 miles from Nome. Figure 4-4 shows the communities in the Southeast sub-region.

### Figure 4-4: Southeast Sub-Region Communities

# St. Michael

*Community and Energy Profile*

# COMMUNITY PROFILE – ST. MICHAEL

**Location:** St. Michael is located on the east coast of St. Michael Island in Norton Sound. It lies 125 miles southeast of Nome and 48 miles southwest of Unalakleet.

**Longitude/Latitude:** -162.0392/63.4781

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** 188 residents employed: 68 in private sector, 118 in local government, and 2 in state government.

**Alaskan Native Name:** Tachik

**Incorporation:** 2nd Class City, 1969

**Elevation:** 98'

**Historical Setting:** A fortified trading post called "Redoubt St. Michael" was built by the Russian-American Company at this location in 1833; it was the northernmost Russian settlement in Alaska. The Native village of "Tachik" stood to the northeast. When the Russians left Alaska in 1867, several of the post's traders remained. "Fort St. Michael," a U.S. military post, was established in 1897. During the gold rush of 1897, it was a major gateway to the interior via the Yukon River. As many as 10,000 persons were said to live in St. Michael during the gold rush. St. Michael was also a popular trading post for Eskimos to trade their goods for Western supplies. Centralization of many Yup'iks from the surrounding villages intensified after the measles epidemic of 1900 and the influenza epidemic of 1918. The village remained an important trans-shipment point until the Alaska Railroad was built.

**Cultural Resources:** St. Michael's population is largely Yup'ik Eskimo today, and many residents are descendants of Russian traders. Seal, beluga whale, moose, caribou, fish, and berries are important staples. The sale and importation of alcohol is banned in the village.

**Community Plans:** Local Economic Development Plan 2005-2010, Hazard Mitigation Plan 2013

## Local Contacts

**Native Corporation:** St. Michael Native Corporation; P.O. Box 59049, St. Michael, AK 99659; Phone: 907-923-3143 Fax: 907-923-3142

**City of:** City of St. Michael; PO Box 59070, St. Michael, AK 99659; Phone: 907-923-3222 Fax: 907-923-2284; Email: relachik@yahoo.com

**Tribal:** Native Village of Saint Michael; P.O. Box 59050, St. Michael, AK 99659;; Phone: 907-923-2304 Fax: 907-923-2406; Email: piuswashington12@gmail.com Website: http://www.kawerak.org/tribalHomePages/stMichael/index.html

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 368 | 401 | Median Household Income | | $32,188 |
| Median Age of Total Population | 22 | 16 | Rate of Unemployment | | 26% |
| Average Household Size | 5 | 5 | Total Number of Housing Units | 93 | 117 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 117 Total, 96 Occupied, 21 Vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Saint Michael Water System, small treated | Population served: 495 |
| Power Generation | AVEC | Diesel generator, PCE subsidized |
| Landfill | Saint Michael Landfill, Class 3, permitted | |
| Access | St Michael Airport, gravel, good condition | General Aviation Airport |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| City Office | EECBG | Catholic Church | |
| Gym Complex | | Assembly of God Church | |
| School | | Water Treatment Plant | |
| Clinic | | Pump House | |
| AC Store | | Crater Shopping Center | |
| IRA Office | | Native Corp Office | |
| Jerry's General Store | | Fuel Store | |
| Public Safety Office | | Post Office | |

| ENERGY PROFILE – St. Michael | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Year/Hours/Condition** |
| Generator – Newage HC1544F | Cummins QSX15 | 499 | Good |
| Generator – Newage HC1504C1 | Detroit Series 60 | 363 | Fair |
| Generator – Kato 6P4-1363 | Detroit Series 60 | 229 | Poor |
| | | | |
| Heat Recovery | Yes (AVEC) | | |
| Alternative Energy integration ready | Yes – intertie and wind with Stebbins (AEA, AVEC) | | |
| Back Up System | Yes | | |
| Peak Electrical Load | 414 | | |
| Annual community load (kwh) | 1,783,493 | | |
| Minimum Load | 210 Average Load | | |
| **Electrical Rates** | | | |
| Production Cost (kwh) | .59 | | |
| Residential Rate | .59 | | |
| Rate with PCE subsidy | .19 | | |
| Commercial Rate | | | |
| Fuel per kWh | .31 | | |
| **Retail Fuel Prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | $7.96 | |
| Gasoline | | $7.85 | |
| Propane 100# tank | | | |
| Coleman 16.4 oz. Disposable Bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | Medium to High | Wind resource conceptual design currently underway for site 1.5 miles NE of Stebbins on road to St. Michael. (AVEC/AEA) | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Medium | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity/# of tanks/type of fuel/condition** | | |
| AVEC | 76,000/Diesel/Old | | |
| Anthony A. Andrews School, Bering Strait School District | 90,000/Diesel/New | | |
| Crowley | 32,000/Gasoline/Old | | |
| Military & VA | 10,000/Diesel/Old | | |
| DOT | 3,000/Diesel/Old | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Circulation/Vacuum sewer | 81 | | |
| Honey-Bucket | Approx. 15 | | |
| | | | |

# Shaktoolik

*Community and Energy Profile*

# COMMUNITY PROFILE – SHAKTOOLIK

**Location:** Shaktoolik is located on the east shore of Norton Sound. It lies 125 miles east of Nome and 33 miles north of Unalakleet.

**Longitude/Latitude:** -161.1539/64.3339

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** 122 residents employed: 44 in private sector, 78 in local government, and 0 in state government. The sale and importation of alcohol is banned.

**Alaskan Native Name:** Iyatayet, old village site Yupik name

**Incorporation:** 2nd Class City, 1969

**Elevation:** 24'

**Historical Setting:** Shaktoolik was the first and southernmost Malemiut settlement on Norton Sound, occupied as early as 1839. Twelve miles northeast, on Cape Denbigh, is "Iyatayet," a site that is 6,000 to 8,000 years old. Reindeer herds were managed in the Shaktoolik area around 1905. The village was originally located six miles up the Shaktoolik River and moved to the mouth of the river in 1933. This site was prone to severe storms and winds, however, and the village relocated to its present, more sheltered location in 1967.

**Cultural Resources:** Shaktoolik is a Malemiut Eskimo village with a fishing and subsistence lifestyle.

**Community Plans:** Local Economic Development Plan 2005-2010, Hazard Mitigation Plan 2013, Response Plan 2015, Hazard Mitigation Plan 2015

## Local Contacts

**Village Corporation:** Shaktoolik Native Corporation; P.O. Box 46, Shaktoolik, AK 99771; Phone: 907-955-3241 Fax: 907-955-3243

**City:** City of Shaktoolik; PO Box 10, Shaktoolik, AK 99771;; Phone: 907-955-3441 Fax: 907-955-3221; Email: skkcity@arctic.net

**Tribal:** Native Village of Shaktoolik; P.O. Box 100, Shaktoolik, AK 997710100; Phone: 907-955-3701 Fax: 907-955-2352; Email: ksagoonick@kawerak.org Website: http://www.kawerak.org/tribalHomePages/shaktoolik/index.html

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 230 | 282 | Median Household Income | | $29,219 |
| Median Age of Total Population | 25 | 27 | Rate of Unemployment | | 28.3% |
| Average Household Size | 4 | 4 | Total Number of Housing Units | 66 | 70 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 70 Total, 64 Occupied, 0 Vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Water pumped from 3 miles, treated, Piped system | Population served: 240 |
| Power Generation | AVEC | Diesel generator |
| Landfill | Shaktoolik Landfill, Class 3, permitted | |
| Access | Shaktoolik Airport, gravel, fair condition | General Aviation Airport |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| City Office | | Covenant Church | |
| Health Clinic | | Church rental unit | |
| Shaktoolik School | EECBG | Native Corp. Store | |
| Teen Center | | Native Store (ANICA) | |
| Tribal Office Building | | Morgue | |
| Water Treatment Plant | EECBG | School shop | |
| Washeteria | | Code Red building | |
| Armory | | DOT shop | |
| NSEDC fish plant | | | |

| ENERGY PROFILE – SHAKTOOLIK | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Hours/Condition** |
| Generator – Kato, 6P4-1450 | Detroit/60 | 207 | Good |
| Generator – Kato, 4P2-1688 | Detroit/60 | 363 | Fair |
| Generator – Kato 4P3-1475 | Cummins LTA-10 | 250 | Poor |
| | | | |
| Heat Recovery | Planned heat recovery from wind | | |
| Alternative Energy integration ready | | | |
| Back Up System | Yes | | |
| Peak Electrical Load | 307 | | |
| Average Electrical Load | | | |
| Annual community load (kwh) | 836,251 | | |
| **Electrical rates** | | | |
| Production Cost (kwh) | .61 | | |
| Residential Rate | .57 | | |
| Rate with PCE subsidy | .19 | | |
| Commercial Rate | | | |
| Fuel per kWh | .33 | | |
| **Retail fuel prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 5.82 | |
| Gasoline | | 6.35 | |
| Propane | | $17.41/gallon | |
| Coleman 16.4 oz. Disposable Bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | AEA and AVEC constructed 2-turbine 200KW system in 2012. Native Store has 3 Skystreams. | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Medium | 80% use driftwood for heat | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity** | **Condition** | |
| AVEC | 79,270/Diesel/Old | | |
| Shaktoolik School | 64,200/Diesel/Old | | |
| Shaktoolik Native Corporation | 196,200/Diesel/Old | | |
| | | | |
| | | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Shaktoolik Water System | 240 | | |
| | | | |
| | | | |

# Stebbins

*Community and Energy Profile*

# COMMUNITY PROFILE – STEBBINS

**Location:** Stebbins is located on the northwest coast of St. Michael Island, on Norton Sound. It lies 8 miles north of St. Michael and 120 miles southeast of Nome.

**Longitude/Latitude:** -162.2881/63.5222

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** 238 residents employed: 68 in private sector and 170 in local government.

**Alaskan Native Name:** Tapraq – first name recorded in 1900

**Incorporation:** 2nd Class City, 1969

**Elevation:** 19'

**Historical Setting:** Redoubt St. Michael was built at nearby St. Michael by the Russian-American Company in 1833. The Eskimo village of "Atroik" or "Atoka" was recorded north of here in 1898 by the U.S. Coast and Geodetic Survey. The Yup'ik name for the village is "Tapraq," and the name Stebbins was first recorded in 1900. The first U.S. Census occurred in 1950, indicating 80 Yup'ik Eskimos.

**Cultural Resources:** This Yup'ik Eskimo village has commercial fishing and subsistence lifestyle. The sale and importation of alcohol is banned.

**Community Plans:** Stebbins Comprehensive Plan 2012

## Local Contacts

**Native Corporation:** Stebbins Native Corporation; P.O. Box 71110, Stebbins, AK 99671; Phone: 907-934-3074 Fax: 907-934-2399

**City of:** City of Stebbins; PO Box 22, Stebbins, AK 99671;; Phone: 907-934-3451 Fax: 907-934-3452; Email: stebbinscity@yahoo.com

**Tribal:** Stebbins Community Association; P.O. Box 71002, Stebbins, AK 99671; Phone: 907-934-3653 Fax: 907-934-3560; Email: tc.wbb@kawerak.org Website: http://www.kawerak.org/tribalHomePages/stebbins/index.html

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 547 | 556 | Median Household Income | | $37,031 |
| Median Age of Total Population | 20 | 20 | Rate of Unemployment | | 23% |
| Average Household Size | 5 | 5 | Total Number of Housing Units | 134 | 153 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 153 Total, 134 Occupied, 19 Vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Stebbins Water Treatment System, surface water | Population served: 590 |
| Power Generation | AVEC | Diesel Generator, PCE subsidized |
| Landfill | Stebbins Landfill, Class 3, permitted | |
| Access | Stebbins Airport, gravel, good condition | General Aviation Airport |

## Non-Residential Buildings and Facilities Energy Information

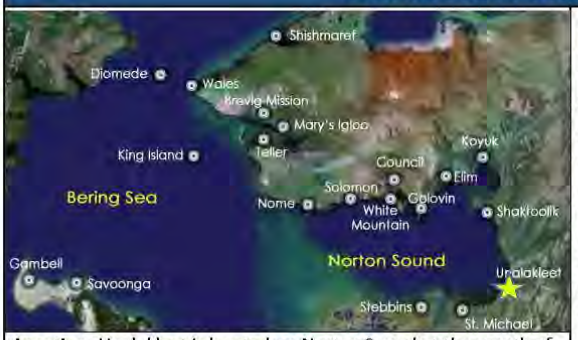
| Name | Notes | Name | Notes |
|---|---|---|---|
| Stebbins K-12 School (Tukurngailnguq School) | AHFC | Water Treatment Plant | |
| IRA Office | | Native Store | |
| City Office | | | |
| Post Office | | | |
| Power Plant | | | |

| ENERGY PROFILE – STEBBINS | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Condition/Hours** |
| Generator | Cummins/ QSX15 | 500 | |
| Generator | Cummins/ KTA19 | 350 | |
| Generator | Cummins/ LTA10 | 250 | |
| | | | |
| Heat Recovery | Y | | |
| Alternative Energy integration ready | | | |
| Back Up System | | | |
| Peak Electrical Load | 299 | | |
| Average Electrical Load | | | |
| Annual community load (kwh) | | | |
| **Electrical rates** | | | |
| Production Cost (kwh) | .56 | | |
| Residential Rate | .59 | | |
| Rate with PCE subsidy | .19 | | |
| Commercial Rate | | | |
| Fuel per kWh | .29 | | |
| **Retail fuel prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | 7.22 | |
| Gasoline | | 7.47 | |
| Propane 100# tank | | | |
| Coleman 16.4 oz. Disposable Bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | Ongoing wind study, approximate completion June 30, 2014. Wind resource conceptual design currently underway for site 1.5 miles NE of Stebbins on Rd to St. Michael (2013) | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Low | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity** | **Condition** | |
| AVEC | 320,500 | | |
| Tukurngailnguq School, Bering Strait School District | 200,000 | | |
| Stebbins Native Corporation | 109,600 | | |
| City of Stebbins | 41,900 | | |
| | | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Self-Haul | 590 | | |
| Honey-Bucket | 590 | | |
| Stebbins Water Treatment System | 590 | | |

# Unalakleet

*Community and Energy Profile*

# COMMUNITY PROFILE – UNALAKLEET




**Location:** Unalakleet is located on Norton Sound at the mouth of the Unalakleet River, 148 miles southeast of Nome and 395 miles northwest of Anchorage.

**Longitude/Latitude:** -160.7881/63.8731

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** The local economy is the most active in Norton Sound, along with a traditional Unaligmiut Eskimo subsistence lifestyle. Fish, seal, caribou, moose, and bear are utilized. The sale and importation of alcohol is banned. 382 residents employed: 186 in private sector, 188 local government, and 8 in state government.

**Alaskan Native Name and Definition:** Unalakleet, "from the southern side"

**Incorporation:** 2nd Class City, 1974

**Elevation:** 27'

**Historical Setting:** Archaeologists have dated house remnants along the beach ridge from 200 B.C. to 300 A.D. Unalakleet has long been a major trade center as the terminus for the Kaltag Portage, an important winter travel route connecting to the Yukon River. Indians on the upper river were considered "professional" traders with a monopoly on the Indian-Eskimo trade across the Kaltag Portage. The Russian-American Company built a post here in the 1830s. In 1898, reindeer herders from Lapland were brought to Unalakleet to establish sound herding practices. In 1901, the Army Signal Corps built over 605 miles of telegraph line from St. Michael to Unalakleet, over the portage to Kaltag and Fort Gibbon.

**Cultural Resources:** Unalakleet has a history of diverse cultures and trade activity.

**Community Plans:** Unalakleet Local Economic Development Plan 2014-2019

## Local Contacts

**Native Corporation:** Unalakleet Native Corporation; P.O. Box 100, Unalakleet, AK 99684; Phone: 907-624-3411 Fax: 907-624-3833

**City of:** City of Unalakleet; PO Box 28, Unalakleet, AK 99684; Phone: 907-624-3531 Fax: 907-624-3130; Email: counk@alaska.com

**Tribal:** Native Village of Unalakleet; P.O. Box 270, Unalakleet, AK 99684; Phone: 907-624-3622 Fax: 907-624-3621; Email: tc.unk@kawerak.org Website: http://www.unalakleet.net

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 747 | 688 | Median Household Income | | $50,625 |
| Median Age of Total Population | 31 | 31 | Rate of Unemployment | | 14.9% |
| Average Household Size | 4 | 4 | Total Number of Housing Units | 242 | 268 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 268 Total, 225 Occupied, 43 Vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Unalakleet Water Treatment System, Groundwater under direct influence of surface water | Population served: 757 |
| Power Generation | Unalakleet Valley Electric Cooperative | Diesel generator, wind turbine |
| Landfill | Unalakleet Landfill, Class 3, permitted | |
| Access | Unalakleet Airport, 2 runways, asphalt, excellent condition | Commercial Service |
| | | |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| Unalakleet Elementary | AHFC | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| ENERGY PROFILE – UNALAKLEET | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | Unalakleet Valley Electrical Cooperative | | |
| | **Make/model** | **Size** | **Condition/Hours** |
| Generator | Cat/ 3456 | 455 | Excellent/8400 hours |
| Generator | Cat/ 3456 | 455 | Excellent/8366 hours |
| Generator | Cat/ 3456 | 455 | Excellent/14176 hours |
| Generator | Cat/ 3456 | 455 | Excellent10096 hours |
| | | | |
| Heat Recovery | Yes, BSSD, City Shop, Water Plant, Trash Bailer | | |
| Alternative Energy integration ready | Yes, 6 wind turbines integrated into current power generation | | |
| Back Up System | Yes | | |
| Peak Electrical Load | Unknown | | |
| Annual community load (kwh) | 4,269,013 | | |
| **Electrical rates** | | | |
| Production Cost (kwh) | .50 | | |
| Residential Rate | .42 | | |
| Rate with PCE subsidy | .21 | | |
| Commercial Rate | | | |
| Fuel per kWh | .20 | | |
| **Retail fuel prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | $6.62 | |
| Gasoline | | $6.62 | |
| Propane 100# tank | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | AEA and Unalakleet Valley Electric Cooperative constructed a 6-turbine system, with boiler and heat recovery loop. (2009) | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Low | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity** | **Condition** | |
| Unknown. Co-op | 787,300 DIESEL | Unknown | |
| Unknown. Co-op | 508,400 AVGAS Jet A | Unknown | |
| Unknown. Co-op | 141,300 GASOLINE | Unknown | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Unalakleet Water Distribution System, Class 2 | 203 | | |
| Unalakleet Water Treatment System, Groundwater, Class 2 | 757 | | |
| Unalakleet Wastewater Collection System | 203 | | |
| Unalakleet Wastewater Treatment System | 203 | | |

### 4.3.1 Energy Issues

All the communities in the Southeast sub-region would benefit from and have identified a need for energy efficient homes, either new or upgraded.

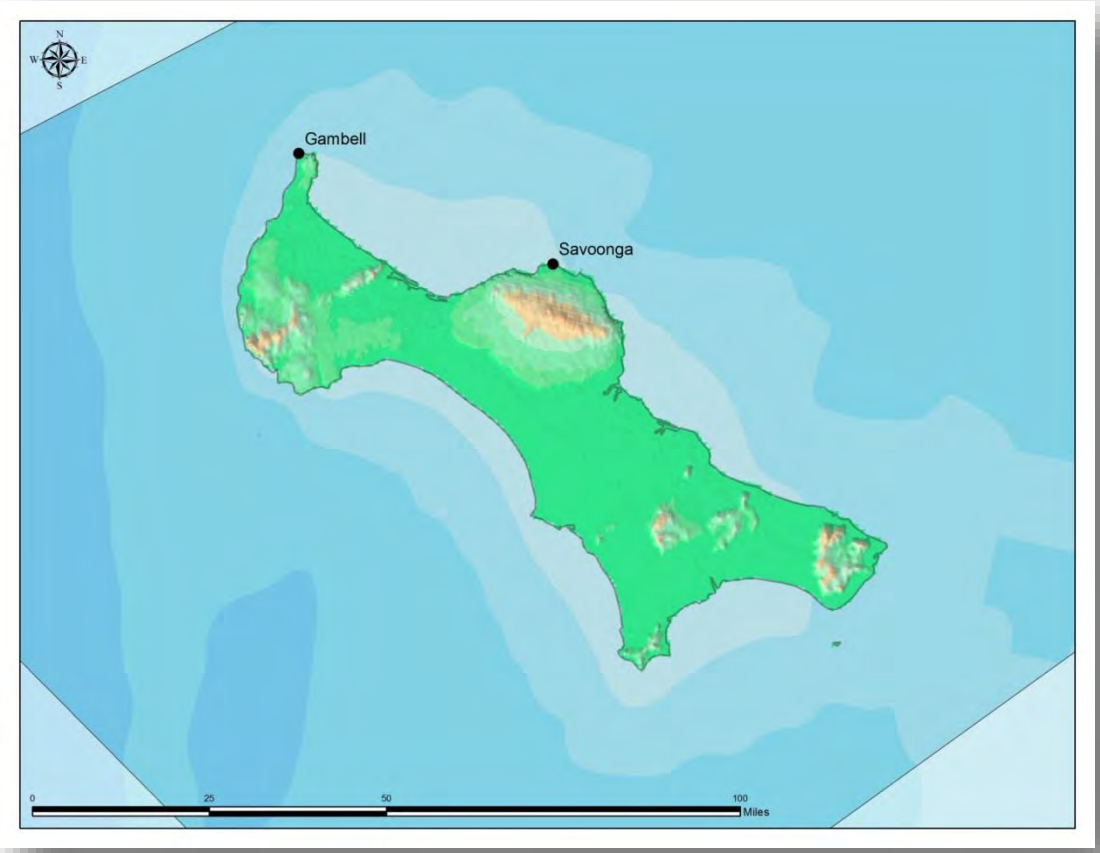
Three of the four community schools in this sub-region have had energy audits by AHFC which should be used in upgrading the schools appropriately. Additional energy audits were completed for three buildings in Shaktoolik: water treatment plant, health clinic and tribal office. A comprehensive list of audits and action items identified in these audits could help shape future auditing and capital investment planning. This analysis should also include waste heat recovery systems and capital improvements.

AVEC erected a met tower in a location later identified as a suitable site for gravel extraction. An alternate met tower site is needed.

## 4.4 Saint Lawrence Island Sub-Region

The Saint Lawrence Island Sub-Region contains two communities - Gambell and Savoonga. Gambell is located on the northwest cape of Saint Lawrence Island, 200 miles southwest of Nome, in the Bering Sea and 36 miles from the Chukotka Peninsula, Siberia. Savoonga is located on the northern coast of Saint Lawrence Island in the Bering Sea, 164 miles west of Nome and 39 miles southeast of Gambell. Figure 4-5 shows the two communities on Saint Lawerence Island.

### Figure 4-5: Saint Lawrence Island Sub-Region



# Gambell

*Community and Energy Profile*

# COMMUNITY PROFILE – Gambell

**Location:** Gambell is located on the northwest cape of St. Lawrence Island, 200 miles southwest of Nome, in the Bering Sea. The city is 36 miles from the Chukotka Peninsula, Siberia.

**Longitude/Latitude:** 63.7797/-171.7411

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** Subsistence based upon harvests from sea: seal, walrus, fish, and bowhead and gray whales. Ivory carving is popular source of income. Bird-watching provides an opportunity for limited tourism. 254 residents employed, 66 in private sector, 185 in local government, and 3 state government.

**Alaskan Native Name and Definition:**

**Incorporation:** 2nd Class City

**Elevation:** 0.0

**Historical Setting:** St. Lawrence Island has been inhabited intermittently for the past 2,000 years by Yup'ik Eskimos. In the 18th and 19th centuries, over 4,000 people inhabited the island in 35 villages. Sivuqaq is the Yup'ik name for the village and for the island. The city was renamed for Mr. and Mrs. Vene C. Gambell, missionaries to the town. A tragic famine between 1878 and 1880 decimated the population. In 1900, reindeer were introduced to the island for local use, and in 1903 President Roosevelt established a reindeer reservation. During the 1930s, some residents moved to Savoonga to establish a permanent settlement there. The city was incorporated in 1963.

**Cultural Resources:** The isolation of Gambell has helped to maintain their traditional St. Lawrence Yup'ik culture, their language, and their subsistence lifestyle, which is based on marine mammals. Residents are almost completely bilingual. Walrus-hide boats are still used to hunt.

**Community Plans:** Gambell Local Economic Development Plan 2012-2017

## Local Contacts

**Village Corporation:** Sivuqaq, Inc. Box 101, Gambell, Alaska 99742 Phone: 907-985-5826 Fax: 907-985-5426

**City:** City of Gambell, Box 189, Gambell, Alaska 99742 Phone: 907-985-5112 Fax: 907-985-5927 Email: cityofgambell@yahoo.com

**Tribal:** Native Village of Gambell, Box 90, Gambell, Alaska 99742 Phone: 907-985-5346 Fax: 907-985-514 Email: nvg90@yahoo.com

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 649 | 681 | Median Household Income | | $30,833 |
| Median Age of Total Population | 26 | 26 | Rate of Unemployment | | 31% |
| Average Household Size | 5 | 5 | Total Number of Housing Units | 187 | 200 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 200 housing units, 164 occupied, 36 vacant | Bering Strait Regional Housing Authority (BSRHA) |
| Water/Wastewater | Piped, 102 connections | City of Gambell owned |
| Power Generation | Diesel generators, AVEC owned, PCE subsidized | AEA and AVEC constructed 3-turbine 300kW system. (2010) |
| Landfill | Not permitted, Class III | City of Gambell owned |
| Access | Asphalt runway, 4,499'x96', condition fair | SOA DOT owned |

## Non-Residential Buildings and Facilities Energy Information

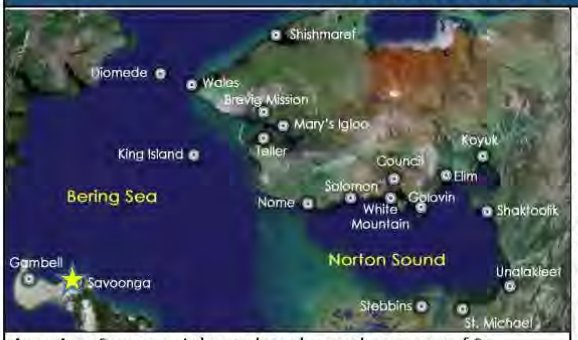
| Name | Notes | Name | Notes |
|---|---|---|---|
| Gambell School | AHFC audit | Water Treatment Plant | EECBG |
| Tribal Office | EECBG | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

| ENERGY PROFILE – Gambell | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | AVEC | | |
| | **Make/model** | **Size** | **Year/Condition/Hours** |
| Generator – Kato 6P4-1900 | Cummins KTA 19G2 | 271 | Unknown |
| Generator – Newage HC1540C | Cummins QSX 15 | 499 | Unknown |
| Generator – Newage 750ROZD4 | MTU 12V2000 | 710 | Unknown |
| | | | |
| Heat recovery | No | | |
| Alternative energy integration ready | Yes, AEA and AVEC constructed 3-turbine 300kW system. (2010) | | |
| Back Up system | Yes | | |
| Peak Electrical Load | 499 (AVEC 2014) | | |
| Annual Community Load (kwh) | 1,883,105 | | |
| Minimum Load | 228 | | |
| **Electrical rates** | | | |
| Production cost (kwh) | .50 | | |
| Residential rate | .54 | | |
| Rate with PCE subsidy | .19 | | |
| Commercial rate | | | |
| Fuel per kwh | .22 | | |
| **Retail Fuel Prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | $7.22 | |
| Gasoline | | $7.81 | |
| Propane 100# tank | | | |
| Coleman 16.4 oz. Disposable bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | AEA and AVEC constructed 3-turbine 300kW system. (2010) | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Low | | |
| Emerging technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity/# of tanks/type of fuel/condition** | | |
| Gambell School | 44,600/Diesel/new 2006 | | |
| AVEC | 240,900/Diesel/new 2006 | | |
| Gambell IRA Council | 332,400/Diesel/1998 – certified 2006 | | |
| City of Gambell | 55,300/Gasoline/1998 – certified 2006 | | |
| | | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Circulating/Gravity | 102 | | |
| | | | |
| | | | |

# Savoonga

*Community and Energy Profile*

# COMMUNITY PROFILE – SAVOONGA




**Location:** Savoonga is located on the northern coast of St. Lawrence Island in the Bering Sea, 164 miles west of Nome. It lies 39 miles southeast of Gambell.

**Longitude/Latitude:** -170.4789/63.6942

**ANCSA Region:** Bering Straits Native Corporation

**AEA Region:** Bering Strait

**Economy:** It is a traditional St. Lawrence Yup'ik village with a subsistence lifestyle based on walrus and whale hunting. Savoonga is hailed as the 'Walrus Capital of the World. The sale, importation, and possession of alcohol is banned in the village. 268 residents employed; 100 in private sector, 167 in local government, and 1 in state government.

**Incorporation:** 2nd Class City, 1969

**Elevation:** 59'

**Historical Setting:** St. Lawrence Island has been inhabited intermittently for the past 2,000 years by Yup'ik Eskimos. The island had numerous villages with a total population of around 4,000 by the 19th century. A tragic famine occurred on the island between 1878 and 1880, severely reducing the population. A reindeer camp was established in 1916 at the present village site. Good hunting and trapping in the area attracted more residents. A post office was established in 1934. When the Alaska Native Claims Settlement Act (ANCSA) was passed in 1971, Gambell and Savoonga decided not to participate and instead opted for title to the 1.136-million acres of land in the former St. Lawrence Island Reserve. The island is jointly owned by Savoonga and Gambell.

**Cultural Resources:** Whale, seal, walrus, and reindeer comprise 80% of islanders' diets. Due to the island's isolation, most residents are bilingual -- Siberian Yup'ik is still the first language. Islanders today have successfully mixed the past with the present.

**Community Plans:** Hazard Mitigation Plan 2012, Community Strategic Development Plan 2004-2009, Local Economic Development Plan 2009-2013.

## Local Contacts

**Village Corporation:** Kukulget, Inc.; PO Box 160, Savoonga, AK, 99769; Phone: 907-984-6184 Fax: 907-984-6185; Email: tc.sva@kawerak.org

**City:** City of Savoonga; PO Box 40, Savoonga, AK 99769; Phone: 907-984-6614 Fax: 907-984-6301; Email: cityofsva@gmail.com

**Tribal:** Native Village of Savoonga; P.O. Box 120, Savoonga, AK 99769; Phone: 907-984-6414 Fax: 907-984-6027; Email: stoolie@kawerak.org Website: http://www.kawerak.org/tribalHomePages/savoonga/index.html

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 643 | 671 | Median Household Income | | $30,313 |
| Median Age of Total Population | 26 | 23 | Rate of Unemployment | | 17.6% |
| Average Household Size | 5 | 5 | Total Number of Housing Units | 160 | 185 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 185 Total, 166 Occupied, 19 Vacant | Bering Straits Regional Housing Authority |
| Water/Wastewater | Savoonga Water Treatment System, Groundwater | Population Served: 671 |
| Power Generation | AVEC | Diesel generator, PCE subsidized |
| Landfill | Savoonga Landfill, Class 3, not permitted | |
| Access | Savoonga Airport, gravel, good condition | Commercial Service |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| City Hall | | Fish Processing Plant | NSEDC |
| Tribal Office | | | |
| Presbyterian Church | | | |
| School | | | |
| Old Clinic | | | |
| New Clinic | | | |
| New Store | | | |
| Water Treatment Plant | | | |

| ENERGY PROFILE – SAVOONGA | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/operator | AVEC operated, City owned | | |
| 3 operators trained | **Make/model** | **Size** | **Condition/Year/Hours** |
| Generator | Detroit 60 | 363 | Fair |
| Generator | Detroit QSX15-G9 | 500 | Fair |
| Generator | Detroit QSX23-G1 | 600 | Excellent |
| | | | |
| Heat Recovery | Yes – Living quarters and storage | | |
| Alternative Energy integration ready | Yes - AEA and AVEC constructed 2-turbine 200KW system. (2010) | | |
| Back Up System | Yes | | |
| Peak Electrical Load | 407 | | |
| Annual Load | 2,184,840 | | |
| Minimum Load | 248 Average load | | |
| **Electrical Rates** | | | |
| Production Cost (kwh) | .55 | | |
| Residential Rate | .54 | | |
| Rate with PCE subsidy | .19 | | |
| Commercial Rate | | | |
| Fuel per kWh | .28 | | |
| **Retail Fuel Prices** | | | |
| | **Commercial** | **Residential** | **Senior** |
| Diesel | | $6.77/gal | |
| Gasoline | | $7.32/gal | |
| Propane 100# tank | | $400.00 | |
| Coleman 16.4 oz. Disposable Bottle | | | |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind diesel | High | AEA and AVEC constructed 2-turbine 200KW system. (2010) | |
| Solar | Medium | | |
| Coal | Low | | |
| Hydroelectric | Low | | |
| Geothermal | Low | | |
| Biomass | Low | | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank owner** | **Tank capacity (# of tanks/type of fuel)** | | |
| Hogarth Kingeekuk Sr. Memorial School | 81,000/Diesel/new 2008 | | |
| AVEC | 216,000/Diesel/new 2008 | | |
| Savoonga Native Store | 306,000/Gasoline, 27000 Diesel tank | | |
| City of Savoonga | 148,501/Diesel/new 2008, 2-25000 Diesel tanks | | |
| | | | |
| **Water & Sewer Infrastructure** | | | |
| **System type** | **Residential** | **Commercial** | |
| Circulating/Vacuum Utilidor system | 162 | | |
| Haul Water/honey buckets | 32 | | |
| | | | |

### 4.4.1 Energy Issues

Like much of the Bering Strait region, this sub-region faces many energy challenges. The isolation of the island makes the cost of energy one of the highest in the region, the state and in the nation.

Other issues cited during the SAG meetings include the lack of energy efficient housing, home energy audits and energy efficiency education. They also have indicated they lack grant writers to assist in the submission and management of energy grants. AVEC has indicated a need for heat recovery systems, wind turbine improvements and the need for operator training to run the power plant more efficiently. While there was support for an additional wind turbine, the USWS and FAA do not support this.

## 4.5 Nome Sub-Region

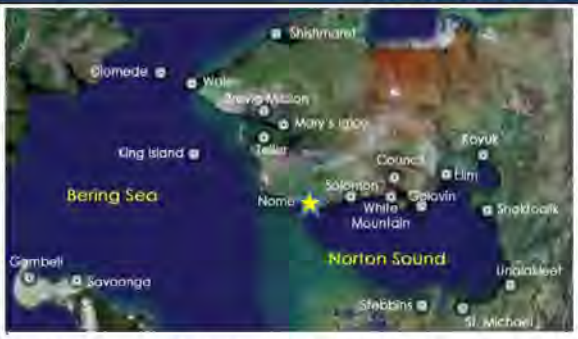
The Nome Sub Region consists of Council, King Island Native Community, Nome Eskimo Community, and Solomon. The Native Village of Mary's Igloo is also located within this sub-region. Mary's Igloo members reside primarily in Teller and their lands are located near Pilgrim Hot Springs. King Island tribal members live in Nome. Solomon and Council are primarily seasonal communities whose citizenry reside in Nome or elsewhere most of the year. Figure 4-6 shows the communities in the Nome sub-region.

### Figure 4-6: Nome Sub-Region

# Nome

*Community and Energy Profile*

# COMMUNITY PROFILE – Nome




**Location:** Nome was built along the Bering Sea on the south coast of the Seward Peninsula, facing Norton Sound. Nome is a city in the Nome Census Area in the Unorganized Borough of the U.S. state of Alaska. The city is located on the southern Seward Peninsula coast on Norton Sound of the Bering Sea.

**Longitude/Latitude:** 64 degrees 30 minutes north, 165 degrees 25 minutes west

**ANCSA Region:** Bering Straits Native Corporation

**AEA Energy Region:** Bering Strait

**Incorporation:** 1st Class City, 1909

**Elevation:** 19'8", on Norton Sound

**Historical Setting:** Gold was found as far back as 1865 by Western Union surveyors.

**Cultural Resources:** Malemiut, Kauweramiut, and Unklikmiut Eskimos have occupied the Seward Peninsula historically.

**Community Plans:** Bering Strait Comprehensive Plan 2009-2013
Local Hazards Mitigation Plan 2008
Long Range Transportation Plan Update 2013
Nome Eskimo Community Strategic Plan 2009
Nome Native Community Strategic Development Plan 2004-2009
Northwest Area Transportation Plan 2003

**Economy:** Government services provide the majority of employment. Nome is the hub for supply, service and transportation for the 15 surroundings villages. Retail services, mining, medical and private business add to the year-round income. Several small gold mines also provide some employment. 1,717 residents employed: 1,246 in private sector, 262 in local government, and 209 in state government.

## Local Contacts

**City of Nome** Box 281 Nome, AK 99762 Denise Michels, Mayor Phone: 907-443-6663 Fax: 907-443-5345
Email: tmoran@nomealaska.org Website: http://www.nomealaska.org/

**Nome Eskimo Community** Box 1090 Nome, AK 99762 Phone: 907-443-2246 Fax: 907-443-3539
Email: nomeeskimo@gci.net Website: http://www.necalaska.org/

## Demographics

| | 2000 | 2010 | | 2000 | 2010 |
|---|---|---|---|---|---|
| Total Population | 3505 | 3598 | Median Income | $31,695 | $71,516 |
| Median Age of Total Population | 33 | 36 | Rate of Unemployment | 6.1% | 9.78% |
| Average Household Size | 3 | 4 | Total Number of Housing Units | 1,356 | 1,503 |

## Infrastructure

| | Description | Notes |
|---|---|---|
| Housing | 1,503 housing units | Bering Strait Housing Authority |
| Water/Wastewater | Ground water, moonlight springs, provided by 3 artesian wells<br>Buried piped system | Located north of Nome, Anvil Mountain<br>6 water delivery customers |
| Power Generation | Nome Joint Utilities | |
| Landfill | Nome Municipal Landfill, Class 2, permitted | |
| Access | Nome Airport—Paved runway 2 miles west of Nome<br>Nome City Field - gravel good condition | Scheduled jet service<br><br>Small aircraft |

## Non-Residential Buildings and Facilities Energy Information

| Name | Notes | Name | Notes |
|---|---|---|---|
| Icy View Fire Station | AHFC | | |
| Nome City Hall and Senior Center | AHFC | | |
| Nome Community Recreation Center | AHFC | | |
| Nome Public Works Building | AHFC | | |
| Nome Volunteer Fire Station | AHFC | | |
| Our Savior's Lutheran Church | ACEA | | |
| Ublugiaq Building | ACEA | | |

| ENERGY PROFILE – Nome | | | |
|---|---|---|---|
| **Power Production** | | | |
| Utility owner/Operator | Nome Joint Utilities Services (NJUS) | | |
| | **Make/Model** | **Size** | **Condition/Year/Hours** |
| Generator | Wärtsilä 12V32 (2) | 5211 kW | 2005 |
| Generator | CAT 3616 | 3660 kW | 1991 |
| Generator | CAT 3516B | 1875 kW | 1999 |
| Generator | CAT 3456 | 400 kW | 2005 |
| | | | |
| Heat Recovery | Y | | |
| Alternative Energy integration ready | Y | | |
| Backup up system | | | |
| Peak Electrical Load | 5787 | | |
| Annual Community Load (kwh) | 22,850,508 | | |
| **Electrical Rates** | | | |
| Production Cost | .4105 | | |
| Residential Rate | .4066 | | |
| Rate with PCE Subsidy | (.4066-.1775) = .2291 | | |
| Commercial Rate | .4066 | | |
| Fuel per kWh | .2123 | | |
| **Fuel Prices (10/01/14)** | | | |
| | **CROWLEY** | **BONANZA** | **SENIOR** |
| Diesel | $5.99/gal | $5.93/gal | N/A |
| Gasoline | $6.04/gal | $5.56/gal | N/A |
| Propane 100# tank | $179.00 | $185.00 | N/A |
| **Alternative Energy** | | | |
| **Source** | **Potential** | **Projects** | |
| Wind Diesel | High | Banner Wind Farm<br>900kW-1.8 mW-NJUS | |
| Solar | High | BSNC 16.8kW installed capacity | |
| Coal | Low | | |
| Hydroelectric | Low/Medium | | |
| Geothermal | Medium/High | Pilgrim Hot Springs | |
| Biomass | Low/Medium Potential | Bulk purchase of pellets | |
| Emerging Technologies | Unknown | | |
| **Bulk Fuel Tank Farm Inventory** | | | |
| **Tank Owner** | **Tank capacity (# of tanks/type of fuel)** | | |
| Nome Joint Utility System | 2,520,000 capacity – DIESEL #2 | | |
| Bonanza Fuel | | | |
| Crowley | | | |
| **Water & Sewer Infrastructure** | | | |
| Utility owner/operator | NJUS | | |
| **System Type** | **Residential** | **Commercial** | |
| Underground Piped Water & Sewer | Approximately 1,980 customers | | |
| Trucked Water | 6 (estimated) | | |
| | | | |

### 4.5.1 Energy Issues

Fuel costs are high in part because of the limited window when fuel is available. In the fall of 2011, a fuel barge with more than 1 million gallons did not arrive as expected. Without the fall shipment, Nome would have run out of fuel in the spring. A 370-foot tanker brought fuel and averted the crisis. It began its journey from Russia in mid-December, picking up diesel fuel in South Korea before heading to Dutch Harbor, Alaska, where it took on unleaded gasoline. It arrived in January. Hauling equipment and supplies available to transport fuel are also limited.

The Alaska Center for Energy and Power (ACEP), in collaboration with the Geophysical Institute, is conducting tests at Pilgrim Hot Springs, located about 60 road miles north of Nome, which they hope will be able to assess the feasibility of developing this site to benefit the region and its residents. The project includes a comprehensive economic analysis of a variety of potential options for developing the springs. Options include a large scale power generation project to support the region as well as direct use, such as a greenhouse to supply fresh produce to the region. Partners in the project include owners of adjacent land: Unaatuq LLC, the property owner, Mary's Igloo Native Corporation (MINC) and the Bering Straits Native Corporation (BSNC).

The new hospital in Nome is reported to be consuming 3,500 gallons of heating fuel per week in the winter.

# 5 Implementation Plan

## 5.1 Prioritized Project Action list

In addition to energy actions identified in the sub-regional energy action tables, regional priority energy actions were identified from the AEA Community Deployment scenarios, stakeholder interviews and input from the public meetings. The priorities were categorized into immediate (0-1 year), short term (1-5 years), medium term (5-10 years), and long term (10-20 years). As the list was developed from information supplied by stakeholders, it is important to note that, as part of Phase III, projects will be reviewed by technical experts as well as the SAG, and revised according to input.

The regional and community energy projects are shown in Table 5-1. The table categorizes the project by the type of action shown as:

- Data Collection
- Program Development
- Training and Education
- Coordination
- Energy Efficiency
- Wind
- Solar
- Biomass
- Hydrokinetic
- Fuel Storage

Table 5-1 also shows estimated costs and potential partners, defined as those that have an interest in collaborating on the project. Also shown is the level of support which indicates who currently has stepped forward to support the project. The next steps shown indicate what needs to be done to keep the project moving.

Larger, longer-term projects could significantly reduce energy costs in the region. These projects include a spur line from the North Slope to the region, a deep water port in Nome or Kotzebue and a road to Nome from the Dalton Highway. It is important that the SAG stay engaged in on-going discussions of these projects with longer lead times. Opportunities to participate in public meetings, teleconferences and provide comments on planning documents are important to ensure that the region has input into the project development phases.

Potential sources, opportunities, and constraints for energy project funding are presented in Appendix D.

## 5.2 Assumptions

The following assumptions were developed to assist in evaluating project feasibility and costs. .

**Fuel and Electricity**

- Diesel will remain major source of energy.
- Fuel and Electricity cost will continue to rise.

- Costs continue to be impacted by the varying time intervals between the placement of orders, timing of departures of fuel deliveries from refineries, fuel storage inventories in communities, distances between refineries, fuel distributors and community storage facilities.
- No new major source of oil is discovered that could offset costs.
- Assume ISER fuel projection and methodology for calculating the B/C ratios.
- Small cordwood systems: $500 per year for maintenance plus labor costs for 1 hour per day to stock the boiler (usually added to an existing job).
- Large systems: Annual maintenance costs of 2% of capital costs.
- PCE will continue, but other subsides will be reduced.
- Costs for communities with more fuel storage will see a savings.
- State and federal dollars for energy projects will decline.
- Larger portion of diesel fuel costs will be replaced by alternative energy.

**Cost and performance of proven and emerging tech**

- Costs decrease as more system become operational and the "bugs" are worked out.
- More technologies are tested and are scaled to work in rural Alaska.
- Alternative energy systems become more efficient and affordable.

**Transportation and Construction**

- The more remote communities will see bigger impacts due to fuel cost increases (Diomede and St. Lawrence Island).
- Bypass Mail will increase transportation costs.
- No road to Nome within planning horizon.

**Construction and replacement cost of existing energy generation and storage**

- Cost will continue to rise for parts and complete replacements.
- Fuel tank replacement costs will rise and available funding for bulk fuel tanks will be harder to come by.

**Maintenance and Operations**

- Assume that more people will get trained and gain experience in maintaining and operating the systems, but turnover and system sophistication will continue to hamper reliable maintenance and operation.

**Building and Energy Use Efficiency**

- Assume building and end-use efficiency and weatherization continue to improve.
- Assume average potential annual savings of 30% for economic energy efficiency measures. On average, achieving this level of savings requires an investment of $6 - $7 per square foot or $17k per unit.

Table 5-1: Regional Priority Energy Actions

| Action Type | Project | Estimated Costs | Potential Partners | Next Steps | Schedule | Project Status |
|---|---|---|---|---|---|---|
| **Data collection** | Collect community wide energy end use data for electricity and space heating | $10k per Community | AEA, NSEDC, Utilities | Identify project champion | Short | Identified |
| | Identify water and sewer infrastructure improvements to reduce energy use | $18k per Community | ANTHC/ARUC, VSW | Coordinate with ANTHC/ARUC | Short | On-Going |
| | Complete Energy Audits – home, public and commercial buildings | Unknown | AEA | Inventory missing audits | Short | On-Going |
| **Training and Education** | Implement K-12 Alaska Smart Energy curriculum. | Unknown | BSSD, NSD, UAF, Kawerak, AEA, DOE | Lobby School Districts to include energy education in schools | Short, Medium, Long | Identified |
| | Provide training to prepare workforce for near term jobs in the energy sector and to improve operator knowledge to operate energy systems more efficiently | Approx. $2,500-$10,000/ class | SAG., ACEP, UAF, AEA, DOE | Identify interested students, seek funding | Short | Identified |
| | Seek funding from a variety of sources | N/A | SAG, Kawerak | Provide energy specific information to grant writers | Short | Identified |
| | Conduct Village Energy Planning workshops | $5k per Community | Kawerak | Identify project champion, develop schedule, agenda, participants, etc. | Short | On-Going |
| **Collaboration** | *Region-Wide* - Collaborate with regulatory agencies to overcome energy project development hurdles | N/A | Steering C., | Identify Project Champion, contact agencies | Short, Medium, Long | On-Going |
| | *Region-Wide* - Participate in discussions regarding long term projects that could benefit energy users such as regional deep water port, a natural gas fired power plant in Prudhoe Bay with statewide transmission, etc. | N/A | SAG, City, Tribes, State, BSNC | Identify Project Champion, prepare list of projects and contacts | Short, Medium, Long | On-Going |
| | *Region-Wide* - Maintain an on-going dialogue with higher education institutions regarding potential pilot energy projects | N/A | UAF | Identify Project Champion, prepare list of contacts, set up meetings | Short, Medium, Long | Identified |

| Action Type | Project | Estimated Costs | Potential Partners | Next Steps | Schedule | Project Status |
|---|---|---|---|---|---|---|
| **Energy Efficiency** | *Region-Wide* - Replace street lights with LED street lights | $5k per Community for inventory | Utilities, Tribes | Identify project champion, meet with utility, conduct inventory | Short-Medium | Identified |
| | *Region-Wide* - Develop appliance replacement program | Approx. $5k per house | AEA, DOE, Kawerak, NSEDC | Identify Project Champion, research funding | Short, Medium | Identified |
| | *Region-Wide* - Design and construct energy efficient prototype home | $250-$300k per house | HUD, CCHRC, NIHA, UAF | Identify Project Champion, contact CCHRC, identify funding source | Short, Medium | Identified |
| | *Region-Wide* - Encourage use of 'green', climate appropriate, building technology in all new construction including schools and housing. | N/A | SAG, ACEP, UAF, NIHA, BSSD, NSD | Identify project champion, meet with NIHA, School Districts | Short, Medium, Long | Identified |
| | *Region-Wide* - Promote the full utilization of the heating assistance program | N/A | DHOUSEHOLDSS | Identify project champion | Short | On-Going |
| | *Region-Wide* - Implement home and commercial energy audit recommendations | Unknown | AEA | Identify project champion | Short, Medium | On-Going |
| | *Region-Wide* - Reduce energy consumption in sewer and water systems | Varies | ANTHC | Seek funding to conduct analysis of W/S energy use in all communities | Short | On-Going |
| | *Brevig Mission and Teller* –Repair Intertie | $1.25 M | AVEC, Local support | Coordinate with funding agencies | Short | On-Going |
| | *Elim Diomede, Golovin, Koyuk, Shaktoolik, Shishmaref, Stebbins, Wale, White Mountain, Unalakleet*- Heat Recovery System Upgrade | $355 -Elim<br>$155k -Diomede,<br>$327 -Shishmaref<br>$435,000 -Koyuk<br>$250,000 –Shaktoolik<br>Stebbins - $1.3m<br>$182k –Wales<br>$120,000 -White.<br>$1.28 M - Unalakleet | ANTHC | Complete project | Short | On-Going |
| | *Wales* – Upgrade the Power Plant | $1.2m | ANTHC | Apply for funding | Short, Medium | On-Going |
| | *Teller* – Install back up power plant | Unknown | AVEC | Apply for funding | Short, Medium | On-Going |
| | *Golovin* – Complete wind feasibility study | Unknown | | Apply for funding | Short, Medium | On-Going |

| Action Type | Project | Estimated Costs | Potential Partners | Next Steps | Schedule | Project Status |
|---|---|---|---|---|---|---|
| **Energy Efficiency** | *Region-wide* - Weatherize residential units | $30,000 per house | E. Steering Committee, Local Support | Identify Project Champion, research funding | Short, Medium, Long | On-Going |
| | *Region wide* – Solar PV at Water Treatment Plant | $75,000 each | ANTHC | Identify Project Champion, research funding | Short | Identified |
| | *Region-wide* – Support continuation of VEEP | N/A | Energy Steering C | SAG to write letter of support, identify supporters | Short | Identified |
| | *Stebbins* – Construct new power plant | $3.5m | AVEC | Complete project | Short, Medium | On-Going |
| | *St Michael* – install waste burner at IRA building | $50,000 | Tribe | Apply for funding | short | Identified |
| | *Region-wide* - Analyze sewer and water deficiencies | $15,000 per community | ANTHC | Identify Project Champion, seek funding | Short, Medium | Identified |
| | *Region-wide* - Develop building energy standards for the region | Unknown | E. Steering Committee, AEA, Housing Authority | Identify Project Champion, research funding | Short, Medium, Long | Identified |
| | *Region-wide* – Analyze and improve energy efficiency in non-residential buildings | Unknown | E. Steering Committee, Local Support | Identify Project Champion, research funding | Short, Medium, Long | Identified |
| **Wind** | *Brevig Mission* –Conduct Wind Feasibility Study | $150,000 | AEA, AVEC | Identify Project Champion, research funding | Short, Medium | Identified |
| | *Diomede, Gambell* – Install wind turbine if allowed by USFWS and FAA. | N/A | USFWS, FAA, Gambell, Diomede Govt. | Identify project champions, Set up meeting with USWS and FAA on wind turbine siting | Short | Identified |
| | *Diomede* – Complete Wind Study | $150,000 | AEA, Diomede Electric | Identify Project Champion, research funding | Short | On-Going |
| | *Elim* - Install wind turbine | | | Identify Project Champion, research funding | Medium, Long | Identified |
| | *Gambell* - Convert *excess* wind energy for residential heat | $420,000 | AVEC | Complete study | Short | On-Going |
| | *Nome* - Capture Excess Wind Energy to heat project | Unknown | NJUS | Apply for funding | Short | Identified |

| Action Type | Project | Estimated Costs | Potential Partners | Next Steps | Schedule | Project Status |
|---|---|---|---|---|---|---|
| **Wind** | *St Michael, Stebbins* - Complete wind turbine final design/construction | | | | | |
| | *St Michael and Stebbins* - Install additional wind turbines in with heat recovery | | | | Short-Medium | |
| | *Shaktoolik* – Complete surplus wind energy recovery study for Water system heat | $250,000 | AEA, AVEC | | Short, Medium | On-Going |
| | *Shishmaref, Wales* - Wind Feasibility Study and Conceptual Design | $142,500 ea. | AEA, AVEC | Identify Project Champion, research funding | Short, Medium | On-Going |
| | *Unalakleet* – Complete repairs to 2ndary load system and low voltage on transmission line | $200,000 | Utility | Conduct turbine efficiency study to determine needed improvements | Short | On-Going |
| | *Unalakleet* – install additional wind turbines | Unknown | Utility | Conduct Feasibility study | Medium | Identified |
| | *Wales* – Replace wind turbines | Unknown | KEA (current turbines), AVEC (new ones) | | Medium | On-Going |
| **Solar** | *Region-wide* - Install Solar PV at Power Plants | $75,000 each | Utilities, ANTHC, DOE,AEA, | Identify Project Champion | Short | Identified |
| **Biomass** | *Elim, Koyuk, Shaktoolik, Unalakleet, White Mtn.,* - Develop Biomass Projects | $50,000 each for study | AEA, DNR | Identify Project Champion, contact DNR, Conduct Biomass Study | Short, Medium, Long | Identified |
| | *Elim* - install woody biomass boilers | | | | | Identified |
| | *Koyuk* – Install biomass for public buildings | | | | | Identified |
| **Hydrokinetic** | *Brevig Mission , Diomede, Golovin, St. Michael, Teller* – Study potential for hydrokinetic projects | $150,000 each | AEA, Utilities | Apply for funding for feasibility studies | Short, Medium | Identified |
| **Geothermal** | *Elim* - Geothermal development | Unknown | AEA, ACEP , local govt. | Collect Water temp data and samples and deliver to UAF, make request to AEA for pilot study | Short, Medium, Long | Identified |
| | *Pilgrim Hot Sprints* – Geothermal development | $60 m | SAG, ACEP, UAF, NIHA, BSSD, NSD, Mary's Igloo | Complete PHS geothermal study and seek funding for conceptual design phase | Short, Medium, Long | Identified |

| Action Type | Project | Estimated Costs | Potential Partners | Next Steps | Schedule | Project Status |
|---|---|---|---|---|---|---|
| **Fuel Storage** | *Teller – Community* Bulk fuel storage | Unknown | AVEC | Apply for AEA or DCEED revolving loan funding | Short | Identified |
| **Transportation** | *Region-wide* - Feasibility Study for Port at Cape Darby | $250,000 | DOT&PF, BSNC | Identify Project Champion, apply for feasibility study funds | Medium, Long | Identified |
| | *Nome Access Road* – Continue participation in on-going discussions | N/A | DOT&PF, Kawerak, BSNC, local governments | Continue attending meetings and teleconference to learn of project updates | Short, Medium, Long | On-0going |

# Appendices

## Appendix A. Bibliography


ADF&G, Division of Commercial Fisheries. "Triplett, Barbara. "Ocean and River Energy." Update: Alternative Energy & Energy Efficiency, Summer 2011: 1." n.d.

Alaska Department of Commerce, Community and Economic Development, Division of Community and Regional Affairs, Research and Analysis Section. *Current Community Conditions, Alaska Fuel Price Report.* Anchorage: DCCED, 2012.

Alaska Department of Fish and Game, Division of Commercial Fisheries. *2011 Norton Sound Salmon Season Summary.* News Release, Nome : ADF&G, 2011.

Alaska Department of Fish and Game, Division of Commercial Fisheries. *2011 Norton Sound Summer Crab Season Summary.* News Release, Nome: ADF&G, 2012.

Alaska Energy Authority. *2011 Power Cost Equalization Data.* Anchorage: State of Alaska, 2012.

Alaska Energy Authority. *A Guide to Alaska's Clean, Local, and Inexhaustible Energy Resources.* Anchorage: State of Alaska, 2007.

Alaska Energy Authority. *Alaska Energy End Use Study: 2012.* Anchorage: WHPacific, 2012.

Alaska Energy Authority. "Alaska Renewable Energy Status Report." Legislative Report, 2013.

Alaska Energy Authority. *Alaska Rural Energy Plan.* Anchorage: State of Alaska, 2004.

Alaska Energy Authority. *Energy Pathway.* Anchorage: State of Alaska, 2010.

Alaska Energy Authority. *Nome Region Energy Assessment.* Final Report, Anchorage: Alaska Energy Aughority, NETL, DOE, 2008.

—. *Renewable Energy Atlas of Alaska.* August 2011. ftp://ftp.aidea.org/AEAPublications/2011_RenewableEnergyAtlasofAlaska.pdf (accessed March 11, 2013).

Alaska Energy Policy Task Force. *Non-Railbelt Reprt Findings and Recommendations.* Anchorage: Alaska Energy Authority, 2004.

Alaska Miners Association. *ALASKA NATIVE CORPORATIONS – A SUMMARY DESCRIPTION, Over 44 Million Acres of Private Fee Simple Land.* Infomational Paper, Anchorage: Alaska Miners Association, n.d.

Alaska Native Tribal Health Consortium. "The Alaska Rural Utility Collaborative." *Brochure.* n.d.

Alaska Power Authority. *Elim Hydroelctiric Project.* Pre-Reconnaissance Report, Anchorage: Tudor Engineering Company, Dryden & Laurue, 1982.

Alaska Power Authority. *Reconnaissance Study of Energy Requirements and Alternatives Appendix 1: Kokuk.* Reconnaissance Study, Anchorage: Alaska Power Authority, 1982.

Alaska Rural Energy Action Council. *Findings and Action Recommendations for Governor Frank Murkowski.* Anchorage: Alaska Energy Authority, 2005.

Amey, Earle B. "Gold." USGS, 2002.

Baring-Gould, E Ian. *Wind-Diesel Power Systems and Integration.* PowerPoint Presentation, National Renewable Energy Laboratory, 2010.

Capstone. "Capstone Turbine Performance." White Paper, n.d.

Cibulka, J. "Kinetic Energy Recovery System by Means of Flywheel Energy Storage." n.d.

Cold Climate Housing Research Center. *Cold Climate Housing Research Center, 2010 Annual Report.* Annual Report, Fairbanks, AK: Cold Climate Housing Research Center, 2011.

Collins, William B., Schwartz, Charles C. "Logging in Alaska's Boreal Forest: Creation of Grasslands or Enhancement of Moose Habitat." 1998. http://bolt.lakeheadu.ca/~alceswww/Bol34b/Alces34(2)_355.pdf (accessed 02 2013).

*Concrete Canvas Shelters.* Product Information, Treforest Ind. Estate, UK: Concrete Canvas Ltd. (UK), 2012.

D&R International, Ltd. *2009 Buildings Energy Data Book.* Washington DC: US DOE, 2009.

Denali Commission. *Distressed Community Criteria 2012 Update.* News Release, Anchorage: Denali Commission, 2012.

Division of Forestry. "2009 Alaska Wildfires by Area and Protection Level." 2009. http://forestry.alaska.gov/pdfs/2009_fire_statistics.pdf (accessed 02 2013).

Fay, Ginny, Alejandra Villalobos Melendez, and Amber Converse. *Alaska Energy Statistics 1960-2010 Preliminary Report.* Anchorage: ISER, 2012.

Fay, Ginny, Katherine Keith, and Tobias Schworer. *Alaska Isolated Wind-Diesel Systems: Performance and Economic Analysis.* Anchorage: Alaska Energy Authority/Denali Commission, 2010.

Fuel Cell Today. *Using fuel cells in... residential heat and power.* Fuel Cell Today, 2012.

Garber-Slaght, Colin Craven and Robbin. *Safe and Effective Exterior Insulation Retrofits.* Fairbanks, AK: Cold Climate Housing Research Center, 2010.

Hanssen, Eric, LCDR, P.E., LEED AP. "Energy Efficiency in the Arctic: ANTHC Engineers Reduce Energy Costs for Rural Alaskan Communities." *Machinatores Vitae: United States Public Health Service Engineer and Architect Newsletter*, July 2012: 4-9.

Hawley, R.D. Merritt and C.C. *Map and Description of Alaska's Coal Resources.* Map, Alaska Department of Natural Resources, Division of Mining and Geological and Geophysical Surveys, 1986.

Hudson, Travis L. *Graphite Creek Deposits.* Vancouver: Cedar Mountain Exploration, Inc., 2011.

Institute of Social and Economic Research. *Alaska Electric Power Statistics.* Anchorage: ISER, 2003.

K.H. Manning, D.L. Stevens. *The Chicago Creek & Norton Sound Area Coal Exploration Programs 1982.* Public Report File 83-2, Fairbanks: Stevens Exploration Managment Corporation, Subcontract to Denali Drilling, Inc for STate of Alaska, DNR, n.d.

Kawerak, Inc. *Bering Strait Comprehensive Economic Development Strategy 2013-2018.* CEDS, Nome: Kawerak Communiyt Planning and Development POrogram and The Bering Strait Development Council, 2013.

Kawerak, Incorporated. "Bering Strait Region Strategic Report." 2009.

Kawerak, Incorporated. "Local Economic Development Plans." 2009.

MacConnell, J. D. *Low Temperature Catalytic Heaters, The Cataheat Range of Flameless Combustion Systems.* Article, Malvern, PA: Matthey Bishop Inc., 1972.

Michael C. Robinson, PhD. *Renewable Energy Technologies for Use on the Outer Continental Shelf.* PowerPoint Presentation, National Renewable Energy Lab, 2006.

Mimi Hogan, Sandra Christopherson, and Ann Rothe. *Formerly Used Defense Sites in the Norton Sound Region: Location, History of Use, Contaminants Present, and Status of Clean-Up Efforts.* Alaska Community Action on Toxics, 2006.

Minerals Management Service, Renewable Energy and Alternate Use Program. *Ocean Current Energy Potential on the US Outer Continental Shelf.* White Paper, U.S. Department of the Interior, 2006.

National Propane Gas Association. *Facts About Propane.* NPGA, n.d.

Neal Fried, Economist. *The Cost of Living in Alaska, Energy prices are a large part of 2011's rise in inflation.* July 2012. http://labor.alaska.gov/research/col/col.pdf (accessed January 9, 2013).

NSEDC. *Consolidated Bulk Fuel.* n.d. http://www.nsedc.com/bulkfuel.html (accessed 05 13, 2013).

NWALT. *Northwest Arctic Strategic Energy Plan.* Kotzebue: NANA Regional Corporation, 2010.

Pacific Northwest National Laboratory & Oak Ridge National Laboratory. *Retrofit Techniques & Technologies, Air Sealing, A Guide for Contractors to Share with Homeowners.* Washington DC: US DOE, 2010.

PND, Incorporated. *Feasibility Study of Propane Distribution throughout Coastal Alaska.* Feasibility Study, Anchorage, AK: Alaska Natural Gas Development Authority, 2005.

Ray Allen Wassillie, Eric Wassillie and Newhalen School. *Newhalen Tribal Page.* n.d. http://www.arctic.net/~newhalen/Tribalpage/ (accessed October 14, 2010).

Rebecca A. Woodgate, Knut Aagaard, Thomas J. Weingartner. *MONTHLY TEMPERATURE, SALINITY AND TRANSPORT VARIABILITY OF THE BERING STRAIT THROUGHFLOW.* Seattle, WA: Applied Physics Laboratory, University of Washington, 2005.

Remley, Carl. "ANTHC Energy Projects." Anchorage: ANTHC, February 26, 2013.

Ruddock, Wayne. *Building Science: Hot Water Heating System Infrared Inspection.* Advanced Infrared Resources, n.d.

State of Alaska. "Statistical Report of the Power Cost Equalization Program, FY2011." 2012.

Szymoniak, Nick, Ginny Fay, Alejandra Villalobos-Melendez, Justine Charon, and Mark Smith. *Components of Alaska Fuel Costs: An Analysis of the Market Factors and Characteristics that Influence Rural Fuel Prices.* Anchorage: University of Alaska Anchorage, Institute of Social and Economic Research. Prepared for the Alaska State Legislature, Senate Finance Committee, 2010.

Tom Ravens, Nyree McDonald, Garrett Yager, Taylor Harper, Erin Eggleston, Aaron Butterer, Jenny Mills, Daniel King, Michael Ulmgren. *Assessment of Hydrokinetic Energy Resources in Alaska Rivers, Preliminary results from 17 sites on the Yukon and Kuskokwim Rivers.* PowerPoint Presentation, Anchorage, AK: University of Alaska Anchorage, n.d.

Triplett, Barbara. "Ocean and River Energy." *Update: Alternative Energy & Energy Efficiency*, Summer 2011: 1.

U.S. General Accounting Office. *Regional Alaska Native Corporations Status 40 Years after Establishment, and Future Considerations.* Report to Congressional Requesters, Washington, D.C.: GAO, 2012.

*Weatherization Programs.* 2013. http://www.ahfc.us/pros/grants/service-assistance-grants/weatherization-programs/ (accessed January 9, 2013).

*Weatherization Services.* n.d. http://www.ruralcap.com/index.php?option=com_content&view=article&id=170&Itemid=85 (accessed January 10, 2013).

## Appendix B. Energy Funding Opportunities

The majority of energy funding resources accessed for Alaska projects come from either the State of Alaska or from U.S. Department of Energy. AHFC funds energy efficiency projects for residences, businesses, and buildings owned by municipalities and educational entities, such as the University of Alaska Anchorage. AEA provides energy audit services to commercial and governmental agencies, renewable energy funds, rural power systems upgrades, bulk fuel construction funds and alternative energy and energy efficiency development programs. AEA also provides economic assistance to rural customers where kilowatt hour charges for electricity are three to five times higher than more urban areas of the state.

Private foundations and corporations also provide funds for smaller projects, some of which can be energy improvements, but most of which are capital funds for construction or reconstruction projects.

In the table that follows, funding sources are listed by type of project and then funding agency. The description of the type of project eligible is included as well as if the funding eligibility is dependent on economic status of the applicant.

### *Energy Performance Contracting*

An option for paying for energy improvements is a method called Energy Performance Contracting. This financing technique allows building owners to achieve energy savings without upfront capital expenses. With Energy Performance Contracting, the building owner enters into an agreement with a private energy service company (ESCO). The ESCO will identify and evaluate energy-saving opportunities and then recommend a package of improvements to be paid for through savings. The costs of the energy improvements are borne by the performance contractor and paid back out of the energy savings. Other advantages include the ability to use a single contractor to do necessary energy audits and retrofits, and to guarantee the energy savings from a selected series of conservation measures. The ESCO will guarantee that savings meet or exceed annual payments to cover all project costs—usually over a contract term of seven to 10 years. If savings don't materialize, the ESCO pays the difference, not the building owner. To ensure savings, the ESCO offers staff training and long-term maintenance service. This type of ESCO has not been proven in rural Alaska, but is a very viable option.

| Program | Funding Agency | Description of Funding Opportunity | Restrictions for Eligibility | Comments |
|---|---|---|---|---|
| **Direct Aid** | | | | |
| Power Cost Equalization | Alaska Energy Authority<br><br>http://www.akenergyauthority.org/ | To provide economic assistance to customers in rural areas of Alaska where the kilowatt-hour charge for electricity can be three to five times higher than the charge in more urban areas of the state. PCE only pays a portion of approximately 30% of all kWh's sold by the participating utilities. | | AEA determines eligibility of community facilities and residential customers and authorizes payment to the electric utility. Commercial customers are not eligible to receive PCE credit. Participating utilities are required to reduce each eligible customer's bill by the amount that the State pays for PCE. |
| Low Income Home Energy Assistance Program -- LIHEAP | Department of Health and Social Services<br><br>http://liheap.org/?page_id=361 | Fuel assistance for low-income families. | Income-based | |
| **Energy Efficiency Improvements** | | | | |
| Alaska Energy Efficiency Revolving Loan Fund Program | Alaska Housing Finance Corporation<br><br>http://www.ahfc.us | Provides financing for permanent energy-efficient improvements to buildings owned by regional educational attendance areas, the University of Alaska, the State or municipalities in the state. Borrowers obtain an investment grade audit as the basis for making cost-effective energy improvements, selecting from the list of energy efficiency measures identified. All of the improvements must be completed within 365 days of loan closing. | Public facilities | |

| Program | Funding Agency | Description of Funding Opportunity | Restrictions for Eligibility | Comments |
|---|---|---|---|---|
| Commercial Energy Audit Program | Alaska Energy Authority<br><br>http://www.akenergyauthority.org/ | Funding for energy efficiency audits for privately owned commercial buildings across Alaska. The program provides reimbursements of qualified commercial energy audits for privately owned commercial buildings up to 160,000 square feet. The maximum reimbursement is set by the building size and complexity and ranges from $1,800 for buildings under 2,500 square feet up to $7,000 for buildings from 60,000 and above. | Owners of commercial buildings | This funding was available in 2013/2014. Check website for notice of future funding availability. Application period is typically November to December. |
| Energy Efficiency Interest Rate Reduction Program | Alaska Housing Finance Corporation<br><br>http://www.ahfc.us | AHFC offers interest rate reductions when financing new or existing energy-efficient homes or when borrowers purchase and make energy improvements to an existing home. Any property that can be energy rated and is otherwise eligible for AHFC financing may qualify for this program. Interest rate reductions apply to the first $200,000 of the loan amount. A loan amount exceeding $200,000 receives a blended interest rate rounded up to the next 0.125 percent. The percentage rate reduction depends on whether or not the property has access to natural gas. | Energy Rating Required | |
| Alaska Home Energy Rebate Program | Alaska Housing Finance Corporation<br><br>http://www.ahfc.us | Homeowners may receive up to $10,000 for making energy-efficient improvements. Based on before and after energy audits. Rebate is based on final energy rating audit outcome. | | Upfront cost for energy audit. |
| Second Mortgage Program for Energy Conservation | Alaska Housing Finance Corporation<br><br>http://www.ahfc.us | Borrowers may obtain a second mortgage to finance home improvements or purchase a home in conjunction with an assumption of an existing AHFC loan and make repairs if need be. | | The maximum loan amount is $30,000. The maximum loan term is 15 years. The interest rate is the Taxable Program or Rural Owner-Occupied, 15-year interest rate plus 0.375. |

| Program | Funding Agency | Description of Funding Opportunity | Restrictions for Eligibility | Comments |
|---|---|---|---|---|
| Village Energy Efficiency Program | Alaska Energy Authority<br><br>http://www.akenergyauthority.org/ | Upgrades are performed in rural Alaskan community buildings. There are currently three phases of funding with Phase II communities recently completed. Community selection was based on the status of the respective village's Rural Power System Upgrade (RPSU). The community either recently received or is slated to receive a new power system. | | |
| Weatherization Program | Alaska Housing Finance Corporation<br><br>http://www.ahfc.us | Weatherization programs have been created to award grants to nonprofit organizations for the purpose of improving the energy efficiency of low-income homes statewide. These programs also provide for training and technical assistance in the area of housing energy efficiency. Funds for these programs come from the US Dept. of Energy and AHFC. | - | |
| RurAL CAP Weatherization | RurAL CAP<br><br>http://www.ruralcap.com | Rural Alaska Community Action Program, Inc. (RurAL CAP) manages a state program administered by Alaska Housing Finance Corporation that offers free weatherization services for low and middle-income residents in western and northern Alaska, the Municipality of Anchorage, and the City and Borough of Juneau. An Anchorage family of four with income up to $87,800 qualifies. | An income-based program | |

| Program | Funding Agency | Description of Funding Opportunity | Restrictions for Eligibility | Comments |
|---|---|---|---|---|
| RurAL CAP Energy Wise | RurAL CAP<br><br>http://www.ruralcap.com | The Energy Wise Program engages rural Alaskan communities in behavior change practices resulting in energy efficiency and energy conservation. This tested model uses community-based social marketing to save energy – a multi-step educational approach involving residents in changing home energy consumption behaviors. Locally hired crews are trained to educate community residents and conduct basic energy efficiency upgrades during full-day home visits. Through Energy Wise, rural Alaskans reduce their energy consumption, lower their home heating and electric bills, and save money. | No income restrictions | Communities receive the following: ten locally hired and trained crew members; on site "launch week" by a RurAL CAP staff for hiring and training of local crews; one community energy fair to engage community residents and organizations.<br>Households receive: Full day home visit from a trained, locally hired crew; household energy consumption and cost assessment conducted with the resident; education on energy cost-saving strategies; an estimated $300 worth of basic, home energy efficiency supplies installed. |
| **Infrastructure Development** | | | | |
| Alternative Energy & Energy Efficiency Development Program | Alaska Energy Authority<br><br>http://www.akenergyauthority.org/ | AEA's Alternative Energy and Energy Efficiency programs promote: 1.) Use of renewable energy resources and local sources of coal and natural gas alternatives to diesel-based power, heat, and fuel production; 2.) Measures to improve efficiency of energy production and end use. | | |
| Bulk Fuel Construction Program | Alaska Energy Authority/Denali Commission<br><br>http://www.akenergyauthority.org/ | With substantial contributions from the Denali Commission, the bulk fuel upgrades program provides funding for the design/engineering, business planning and construction management services to build code-compliant bulk fuel tank farms in rural communities. The bulk fuel upgrade retrofit and revision program, with financial support | | |

| Program | Funding Agency | Description of Funding Opportunity | Restrictions for Eligibility | Comments |
|---|---|---|---|---|
| | | from the Denali Commission, provides funding for repairs to enable affected communities to continue to receive fuel. | | |
| Emerging Energy Technology Fund | Alaska Energy Authority<br><br>http://www.akenergyauthority.org/ | The Authority may make grants to eligible applicants for demonstration projects of technologies that have a reasonable expectation to be commercially viable within five years and that are designed to: test emerging energy technologies or methods of conserving energy; improve an existing energy technology; or deploy an existing technology that has not previously been demonstrated in Alaska. | | Eligible applicants: An electric utility holding a certificate of public convenience and necessity under AS 42.05; an independent power producer; a local government, quasi-governmental entity, or other governmental entity, including tribal council or housing authority; a business holding an Alaska business license; or a nonprofit organization. |
| Renewable Energy Fund | Alaska Energy Authority<br><br>http://www.akenergyauthority.org/ | Solar water heat, photovoltaics, landfill gas, wind, biomass, hydroelectric, geothermal electric, fuel cells, geothermal heat pumps, CHP/cogeneration, hydrothermal, waste heat, transmission or distribution infrastructure, anaerobic digestion, tidal energy, wave energy, fuel cells using renewable fuels, geothermal direct-use | | |
| Rural Power Systems Upgrades | Alaska Energy Authority/Denali Commission<br><br>http://www.akenergyauthority.org/ | Upgrades may include efficiency improvements, powerhouse upgrades or replacements, line assessments, lines to new customers, demand-side improvements and repairs to generation and distribution systems. | | |

| Program | Funding Agency | Description of Funding Opportunity | Restrictions for Eligibility | Comments |
|---|---|---|---|---|
| Tier 1 Grant Program | Rasmuson Foundation<br><br>http://www.rasmuson.org | Grants for capital projects, technology updates, capacity building, program expansion and creative works, including building construction/renovation/restoration, technology upgrades in community facilities, and capacity building grant support. | | |